THE EFFECTS OF COGNITIVE-BEHAVIORAL MOTIVATION FOR HEALTH IMPROVEMENT ON ANTHROPOMETRIC MEASUREMENTS IN HIGH RISK INDIVIDUALS

THESIS

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THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Cost Analysis

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March 2012

AFIT/GCA/ENV/12-M02

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Abstract

Unhealthy lifestyles cost businesses, governmental organizations, and the United States military billions of dollars every year. To fight this rising cost as well as potentially save lives this study sought to understand if a cognitive-behavioral motivation treatment could positively affect the cognitive variables (attitude, self-efficacy, and locus of control) that induce long term behavior change. Anthropometric measurements, specifically body mass index, abdominal circumference, and abdominal height, were used to determine if long term behavior change resulted from the treatment. The Theory of Planned Behavior was the basis of this thesis' model, while the Valence, Instrumentality, and Expectancy (VIE) theory was the foundation for the cognitive-behavioral motivation treatment. Structural Equation Modeling (SEM) tested the theory based model and found two results: a cognitive-behavioral motivation treatment can positively affect cognitive changes that improve behavior and health and, a causal or mediation relationship among the cognitive variables of locus of control and self-efficacy was found instead of the predicted parallel relationship. Effective implementation of an intervention like the one used in this study could lower the United States Air Force's health care bill by as much as $40 million, improve employee efficiency and mission capability, enable longer healthier lives, and prevent premature death.

Dedication

To Papa (USA, WWII Silver Star recipient), Nannie, Dad (Colonel, USAF, DC) and Mom, thank you for your enduring love, strictness, high expectations, and instilment of hard work. Each of you, in your own way, has molded me into the person I am today and for that I am eternally grateful.

Acknowledgments

I have learned in life that great accomplishments rarely involve only the person who accomplishes them. There are a myriad of individuals, too many to name them all, who have helped me to accomplish this thesis. First, I would like to thank my thesis advisor, Lt Col Darin Ladd, for his support, time, guidance, and perfectionism. I am also grateful for the constant encouragement and welcomed advice from my friend 1st Lt Marie Harnly. Last be not least, I would like to thank my husband for encouraging me to apply for this program, lending a helping hand when needed, understanding when I had to forgo fun things in order to study, and most importantly for his constant love and support. I am very grateful for these individuals who made the accomplishment of this thesis possible.

Aimee T. Kirchner

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THE EFFECTS OF COGNITIVE-BEHAVIORAL MOTIVATION FOR HEALTH IMPROVEMENT ON ANTHROPOMETRIC MEASUREMENTS IN HIGH RISK INDIVIDUALS

I. Introduction

Introduction

Unhealthy lifestyles cost businesses, governmental organizations, and the United States military billions of dollars every year. One way to quantify the cost to businesses due to poor employee health is by measuring productivity in the workplace. Compared to healthy coworkers, unhealthy employees' productivity levels are lower and their levels of absence from the workplace are higher.

Health studies quantify diminishing productivity by the high costs of *absenteeism* and *presenteeism*. A person present at work "but not at full capacity" defines *presenteeism* (California Department of Health Services, 2005:5). The health risk factors contributing to absenteeism and presenteeism in a California study include: physical inactivity, obesity, and being overweight. The California study determined the aggregate cost (for Californians only) of health risk factors, absenteeism, presenteeism, and short term disability to equal $21.68 billion in 2000 (California Department of Health Services, 2005:8). A disturbing fact is that this amount does not fully encompass the total costs of poor employee health to businesses; the inclusion of death due to poor health would make the amount a more accurate representation of the true cost to businesses.

Although often considered a profession with a healthy serving population, lifestyle related health problems occur within the United States military. Specifically a percentage of United States military members and government civilians fall into at-risk categories, resulting in poor health, early death rates, and increasing health costs due to unhealthy lifestyles. From a military perspective, productivity suffers as well as mission effectiveness.

A way to reduce both the negative effects of poor health and the health care bill involves increasing employee health; however, improving employee health is a complex task. In order to improve employee health, the employees must first be motivated to change their behaviors. Studies show that motivation can improve health (West et al., 2010:8), but effects are temporary unless cognitive changes occur (Ogden, 2000:1024).

Cognitive changes only occur when an individual has internalized and taken ownership of the behavior change. Therefore healthy behavior may only increase by increasing individuals' internal motivation. The question is how can an individual increase their internal motivation? Implementing a motivational treatment might be a way to increase an individual's motivation. Thus, employers seeking healthier employees and lower health care costs would benefit from selecting the proper motivational techniques (treatment) which improve health.

Cognitive-Behavioral Motivation versus Behavioral Motivation

Cognitive changes concentrate "on the assessment and modification of thoughts, beliefs, emotions, self-attributions, self-esteem, and self-efficacy" (Van Dorsten & Lindley, 2008:907). Specifically the improvement of cognitive elements in individuals

leads to improved healthy behavior. When motivation strategies target behavior directly, not affecting cognitive aspects of the brain, reversion back to the original state is common (Ogden, 2000:1024). Therefore, if motivation does not address key cognitive components, then behavioral change may only be short-term. Figure 1 displays the previously accepted model addressing only behavioral change.

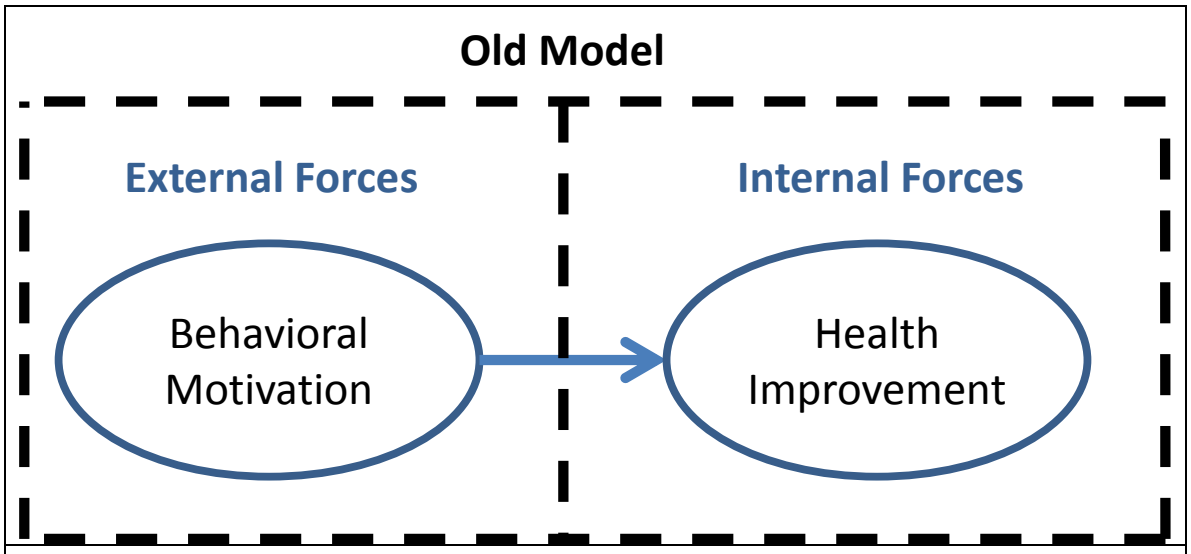

Figure 1 Common Model Not Affecting Cognitive-Behavioral Motivation

Most weight loss programs use behavioral based motivation to affect behavior. Several different weight loss treatments, found in weight loss programs, try to effect a motivational change in behavior without addressing cognitive variables (Figure 1). Individuals using behavioral treatments to induce weight loss are normally successful in the short term; however, a study found only three percent of individuals maintain their initial weight loss over a four year period (Kramer, Jeffery, Forster, & Snell, 1989:132). These programs focus only on behavior change and do not focus on fixing the cognitive aspects that caused the initial weight gain.

The following principles are typical of programs that focus on behavioral motivation without including cognitive restructuring: a description of the behavior needing control, "modification and control of the discriminatory stimuli governing eating," technique development which controls the act, and "prompt reinforcement of behaviors which delay or control" the act (Penick, Filion, Fox, & Stunkard, 1971:50-51).

A program that uses cognitive behavioral motivation (Figure 2) incorporates the following techniques: goal directed, process oriented which focuses on how to change a behavior not what to change, and focuses on small changes instead of large changes (Foster, Makris, & Bailer, 2005:230S). Cognitive behavioral modification differs from behavioral motivation in the way it tries to increase an individual's ability to internalize and address problems. Behavioral motivation focuses on performing or not performing certain tasks; it does not teach the individual to understand what triggers certain actions and how to cope with those triggers.

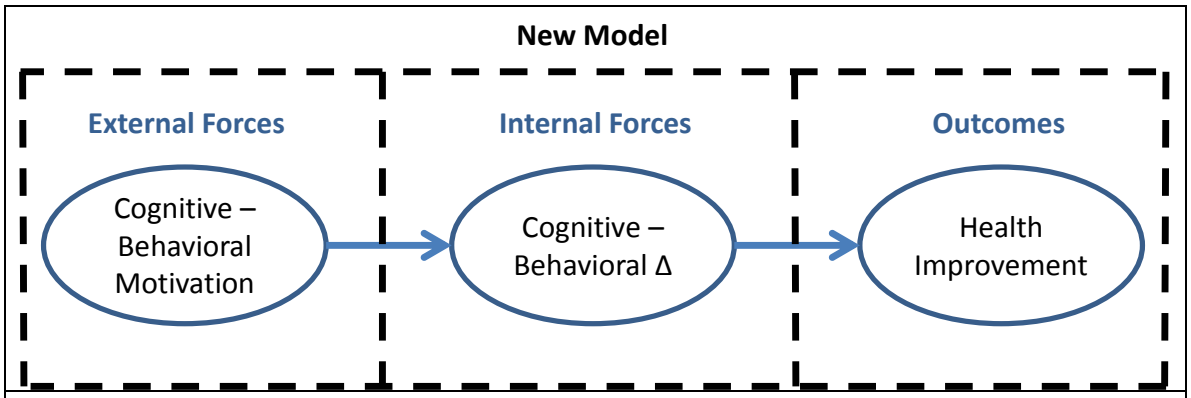

Figure 2 Theoretical Model

Cognitive-Behavioral Variables

A review of the Theory of Planned Behavior (TPB) determined two important behavioral predictors that a cognitive-behavioral motivation might affect. The TPB states attitude toward behavior and perceived behavioral control directly affect one's intention to perform that specific behavior. Intention, in turn, leads to behavior when the opportunity arises (Ajzen, 1991:188). This thesis operationalized these two variables, attitude and perceived behavioral control, added a third, locus of control, due to its hypothesized importance in the personal health improvement domain.

The first of three variables in this thesis' model is attitude. A positive or negative attitude helps in the formulation of a positive or negative consequence towards a certain behavior. These consequences then serve as predictors of behavior through the use of intentions. The second variable, in this thesis' model is self-efficacy, which Ajzen and Bandura agree is essentially interchangeable with perceived behavioral control, because they both "are concerned with perceived ability to perform a behavior" (Ajzen, 2002:668; Bandura, 1977:193). These two variables have shown universally applicable in studies but in the domain of personal health improvement a third variable, locus of control, may also prove important.

Locus of control is the last variable in this thesis' model. Locus of control was included to assess whether or not a cognitive-behavioral motivational treatment in the personal health domain could increase individuals' beliefs in their control over actions and outcomes, and whether or not this translated to behavior. For example, when individuals possess an internal locus of control, they believe their actions directly

influence a specific outcome; however, an individual with an external locus of control believes external factors influence the outcome (Holt, Clark, & Kreuter, 2001:329).

Cognitive-Behavioral Motivation Techniques

The goal of the external cognitive-behavioral motivation treatment in this thesis was to positively change the cognitive-behavioral variables of attitude, self-efficacy, and locus of control (internal variables), in-turn changing individual behavior improving health. This led the researchers to ask the following question: what are the external motivational techniques that can ultimately affect the internal variables that will improve an individual's health?

Valence, Instrumentality, and Expectancy

If the TPB represents the translation of internal variables into measurable behavior, then the valence, instrumentality, and expectancy (VIE) theory represents the theory of how to change these internal variables. The VIE theory is a goal oriented technique first used to help explain employee motivation (Leon, 1981:45; Dachler & Mobley, 1973:398). Valence is "how desirable or undesirable these consequences or work outcomes are" (Dachler & Mobley, 1973:398); the attitude variable in this thesis represents valence. The definition of instrumentality is "how certain the employee is that a given level of performance will lead to various rewarding or punishing consequences" (Dachler & Mobley, 1973:398); the locus of control variable in this thesis represents instrumentality. Last, expectancy is "a person's subjective probability or perceived likelihood that he can perform at a given level of performance" (Dachler & Mobley, 1973:398); the researchers determined self-efficacy represented expectancy in this thesis

because self-efficacy was an aspect of expectancy (Maddux, Norton, &Stoltenberg, 1986: 783). Therefore, Equation 1 builds on VIE theory to explain the motivational force (MF) employees exhibit at work based on the goal j, action i, and outcome k in terms of valance (V), Instrumentality (I), and Expectancy (E) (Leon, 1981:45).

$$MF_i = E_{ij}*(\sum I_{jk}*V_k) \quad (1)$$

If a cognitive-behavioral motivation treatment targets these three variables then an increase might occur within each cognitive variable corresponding to increases in healthy behavior and improved health. For example, one of the objectives of the cognitive-behavioral treatment used in this thesis was to change the participants from an external-directed goal setter to an internal-directed goal setter. When an individual internally sets task goals that particular individual displays an internal locus of control; however, when an individual sets goals based on beating others, ego goals, this forms from external motivation (Simons, Dewitte, & Lens, 2000:335; Simons, Dewitte, & Lens, 2004: 344). Internal motivation has shown more effective in long-term health improvement.

Conclusion and Research Question

This study seeks to understand if cognitive-behavioral motivation can positively affect the cognitive variables that induce long term behavior change. Successful motivational techniques focus on changing individuals' cognitive states instead of on behavioral changes. Therefore, applying cognitive motivational techniques should improve individual health. Other effects of positive changes in individual health,

although not measured in this study, are decreases in both the need for health care and organizational health care costs.

II. Literature Review

Chapter Overview

This chapter examines how a cognitive-behavioral motivation treatment may cause cognitive restructuring in individuals, leading to long-term behavioral change. First, it asserts that cognitive-behavioral motivation causes cognitive restructuring—changes in cognitive (internal) variables within the brain that help form a long-term intention to perform a certain behavior. Second, it asserts that effective cognitive restructuring may lead to positive behavioral changes, resulting in healthier individuals.

Figure 3 illustrates this by adding cognitive variables to Figure 2 and hypothesized causal relationships (arrows) between the variables. This paper asserts that internal motivation (also termed behavioral intention) is more likely to result if cognitive restructuring occurs in the cognitive variables of attitude, self-efficacy, and locus of control. Therefore, the objective of the cognitive-behavioral motivational treatment used in this study was to create a positive change in the variables of attitude, self-efficacy, and locus of control.

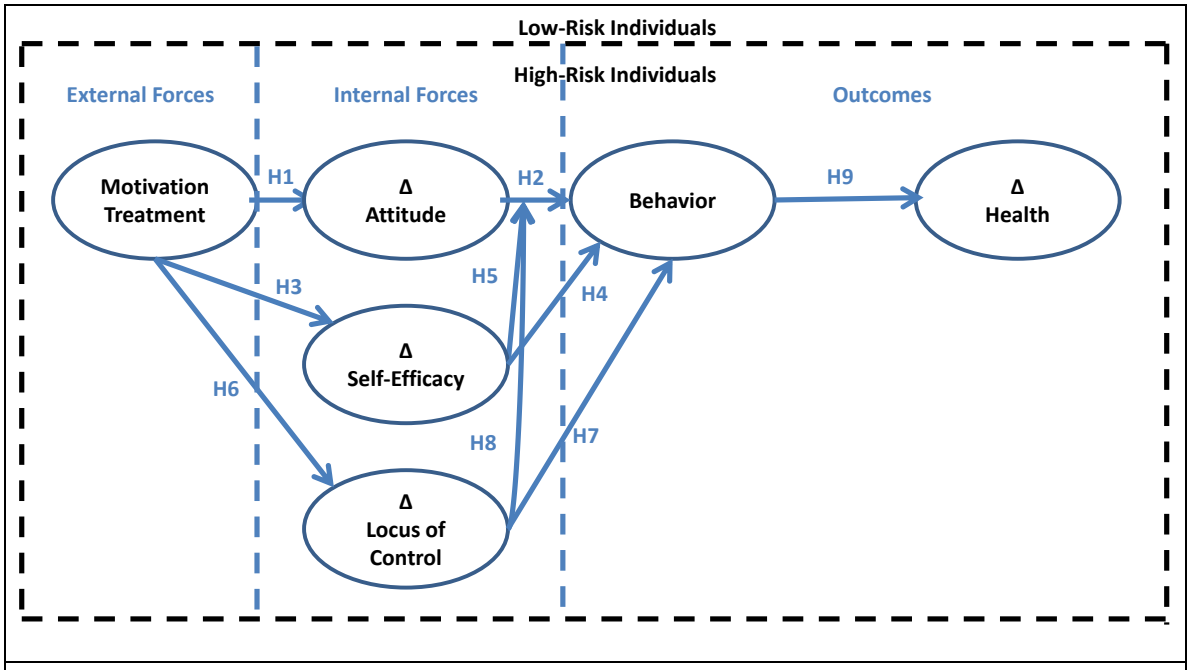

Figure 3 Theoretical Model with Variables

This discussion begins by examining how cognitive changes may cause long term improvements in behavior, whereas behavioral changes may only cause short-term improvements in behavior. Because the goal of any health improvement treatment is long-term behavioral improvements, this discussion next turns to cognitive-behavioral motivational treatments—those that may cause changes in the cognitive elements of individuals (called cognitive restructuring). Finally, the discussion focuses on how cognitive restructuring occurs in the cognitive-behavioral variables described in the TPB. Overall, this discussion supports a number of hypotheses about how a cognitive-behavioral treatment might cause cognitive restructuring, and then how this cognitive restructuring might lead to an increase in desirable behavior, and ultimately, health improvement.

Behavioral vs. Cognitive Changes

The ultimate goal of any behavioral treatment—behavioral changes—can be defined as behavioral modification, or the actual changes people implement into their lifestyles (Kazdin, 1994:2; Miltenberger, 1997:5-6). A typical example of a behavioral modification program is most weight loss programs. Setting attainable goals, self-monitoring of behavior through use of pedometer measurements and food diaries, modifying stimulus cues that lead to eating, and eliminating all the fatty foods from the household are typical applications of behavior modification (Van Dorsten & Lindley, 2008:907). The behavioral modification in the Wright Patterson Air Force Base Health and Wellness Center (HAWC) study did just this; however, the HAWC study also tested the effectiveness of its current internal programs and personnel. While the use of behavior modification techniques has been shown to be successful for short-term weight loss (Ogden, 2000:1018), a troubling long-term finding is that less than three percent of individuals maintain their initial weight loss over a four year period (Kramer et al., 1989:132).

On the other hand, cognitive-behavioral treatments—those that target cognitive changes in individuals—have shown better long-term results in a wide variety of contexts (Elfhag & Rossner, 2005: 76-77; West el al., 2010:8). Cognitive-behavioral changes are the "modification of thoughts, beliefs, emotions, self-attribution, self-esteem, and self-efficacy" (Van Dorsten & Lindley, 2008:907). To reiterate, cognition is how individuals mentally process thoughts about themselves or a specific event. These formulated thoughts may affect how an individual emotionally and behaviorally responds or fails to respond to an event (Hollon, 1998:289). For example, if an individual holds

dysfunctional beliefs on weight loss, then that individual may tend to overestimate the difficulty of the weight loss task—or feel helpless to make the required changes. In turn, this mental state may lead to a failure to initiate or sustain behavior(s) required to cause or maintain weight loss. Therefore, implementing a program targeting a change in dysfunctional beliefs or one that encourages formation of facilitating beliefs, a cognitive-behavioral motivation treatment, may better predict behavioral intentions.

Cognitive-behavioral motivation is an external stimulus that focuses on changing cognitive variables that might cause negative thoughts towards a desired behavior. Cognitive changes can take place by teaching individuals "to monitor the thoughts that interfere with their ability to meet behavioral goals, identify distortions in those thoughts, and replace the dysfunctional thoughts with more rational ones" (Fabricatore, 2007:95). When an individual is trying to lose weight without proper cognitive restructuring, small issues may lead to difficulties sustaining weight control progress. For example, individuals might abandon weight control entirely, or may experience gradual cessation of weight loss before attaining their goal weight (Cooper & Fiarburn, 2001:504). In studies, cognitive-behavioral therapy, diet, and exercise produce superior and longer lasting weight losses in comparison to using diet and exercise alone (Block, 1980:279; Dennis, Pane, Adams, & Qi, 1999:63; Hollon, 1998:289; Sbrocoo, Nedegaard, Stone, & Lewis; 1999:265).

A study, "The Correlates of Long-Term Weight Loss," showed the importance of cognitive restructuring for long run behavioral changes. This study found that weight loss maintainers believed obesity is a result of psychological changes instead of medical; it

also found a relation between external motivation and increased confidence. The same study endorsed the psychological model for weight maintainers: "it is not just having higher motivations per se, but motivations which relate to the individual's psychological state" (Ogden, 2000:1024). Therefore cognitive-behavioral motivations targeting individuals' psychological state changes their motivations from external to internal. Individuals possessing internal motivation, "owning" the lifestyle change, are more likely to *maintain* weight loss, itself a sign of cognitive restructuring (Ogden, 2000: 1024). These findings show the importance of cognitive-behavioral motivation in causing long term behavior change.

Albert Bandura, who states "cognitive processes play a prominent role in the acquisition and retention of new behavior patterns" (Bandura, 1977:192), provides another view of how cognitive processes affect behavior. He asserts that cognitive processes can change internal motivation; which he calls "behavioral intention." For example, if a negative future outcome is apparent, an individual's internal motivation to change his/her behavior may increase. This increase in internal motivation comes from wanting to change the negative outcome to a positive outcome (Bandura, 1977:192). This example shows how the combination of cognitive-behavioral motivation and behavioral intention can cause a behavioral change. Relating cognition to new behavior patterns and motivation, Bandura shows the need for changing factors related to mindset in order to attain a sustained behavioral change.

Cognitive-Behavioral Motivation Treatment using Goals

One definition of motivation is "the concept we use when we describe the forces acting *on* or *within* an individual to initiate and direct behavior" (Gibson, Ivancevich, & Donnelly, 1997:126). In the study of cognitive restructuring, the two forces are treated separately, with "forces acting on" an individual termed "external motivation," and "forces acting within" an individual termed "behavioral intention" (Gibson, Ivancevich, & Donnelly, 1997:126). This distinction is important because the goal of a cognitive-behavioral motivation is to "externally" cause an individual to create a self-reinforcing "internal" behavioral intention that persists over time.

Most external cognitive-behavioral motivation treatments focus on goals. Motivational techniques involve goals because they "are typically thought to represent fairly stable orientations that individuals develop and bring with them to achievement situations" (Simons, Dewitte, & Lens, 2004:344). Goals can form internally or externally and be short term or long term. Goal formulation in relation to time parallels individuals' current cognitive state; therefore, the objective is for individuals to set goals that are internally motivated and are long term.

Internal goals represent the actual desires of an individual without the influence of external pressures. Having a long term goal imbedded with shorter term goals serves as a way to stabilize the changes incurred through the use of internal goals. Therefore an effective cognitive-behavioral treatment, and the one used in this thesis, focuses on internal (task-focused) goal setting with short term (proximal) goals leading to a larger long term (distal) goal.

Task Goals vs. Ego Goals

Task goals form internally. In a school setting a student may develop task goals if his/her purpose is the expansion of knowledge. This student takes on challenging tasks even if failure is possible because s/he understands that learning occurs during success or failure. Task goals "have been associated with a constellation of cognitive, affective, and behavioral outcomes…higher levels of efficiency, task value, positive affect, interest, effort, the use of better cognitive metacognitive strategies as well as better performance" (Simons, Dewitte, & Lens, 2004:344). Knowing the positive outcomes that task goals can produce makes them essential in cognitive-behavioral motivation techniques.

Task-goals contrast with ego goals, which form externally. These goals originate in individuals whose main concern is their performance relative to others. Consequently "these goals are generally seen as less adaptive in terms of subsequent affect, motivation, strategy use, and hence performance" (Simons, Dewitte, & Lens, 2004:344); therefore, effective cognitive-behavioral motivation seeks to cultivate task goals, or to change ego goals into task goals.

Distal vs. Proximal Goals

Individuals may set goals in either a proximal or a distal time frame, or both. Goals that are near the present are proximal while goals in the distant future are considered distal goals (Simons, Dewitte, & Lens, 2004: 347). Both Simons, Dewitte, and Lens (2004) and Locke and Latham (1985) state that, while proximal goals may be primarily externally driven, distal goals are mainly internally driven. For example, "students who emphasized their personal development when studying the course (i.e.,

who are internally regulated) were more task oriented than students who are externally regulated (by future rewards) or emphasize the compulsory nature of the course ('because I have to')" (Simons, Dewitte, & Lens, 2004:351). Simon et al. (2004) argue that task-oriented, distal goals are superior; however, Locke and Latham (1985) find a hybrid of proximal and distal goals more suitable.

Locke and Latham (1985) state a hybrid use of both proximal and distal goals lead to better outcomes. Their argument is that an individual requires both a set of smaller, proximal goals to work towards and accomplish along with a distal, or ultimate, goal (Locke & Latham, 1985: 217). Goal setting literature confirms that individuals setting smaller, achievable waypoints that are focused on achieving larger, long-term goals are more likely to lead to successful long-term outcomes (Locke & Latham, 1985: 217). The theory that Locke and Latham (1985) present depends on setting and achieving a distal goal; this is arguably the same thing that Simon et al. (2004) states. The only difference between Locke and Latham (1985) and Simon et al. (2004) is Locke and Latham (1985) present proximal goals as a means to achieve a distal goal. Therefore, an effective cognitive-behavioral motivation treatment is one that uses goal setting techniques that focus on both proximal task and distal task orientations.

As described above, goal-setting is inherently behaviorally-focused; however, a goal-setting treatment that focuses simply on behavior might not be as effective as one that focuses on cognitive restructuring. With the above information in mind, this discussion now turns to cognitive-behavioral variables, and how a motivational goal-

oriented treatment may change these cognitive-behavioral variables, resulting in cognitive restructuring.

The Factors That May Cause Cognitive Restructuring

The cognitive variables, attitude, self-efficacy, and locus of control, consistently predict behavioral intentions (internal motivation) and, in-turn, behavior (Sherman & Fazio, 1983:332; Dennis & Goldberg, 1996, 113; Deci et al., 1985:113). Because these beliefs are relatively persistent (Sbrocco et al., 1999:265), if a goal-setting treatment changes these beliefs, then it seems likely that long-term behavior may also change. A better understanding of the cognitive elements and how each one may cause changes in behavior follows.

Figure 4 shows an overview of how each cognitive element may cause changes in behavior; it focuses directly on the cognitive elements in Figure 3while adding the element behavioral intention (not measured in this study). Behavioral intention is a key internal variable required to understand how cognitive variables may create internal motivation (behavioral intention) which displays as behavior. Behavioral "intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (Ajzen, 1991:181). Therefore, an increase in an individual's internal motivation increases his/his behavioral intention, which increases the likelihood of behavioral performance.

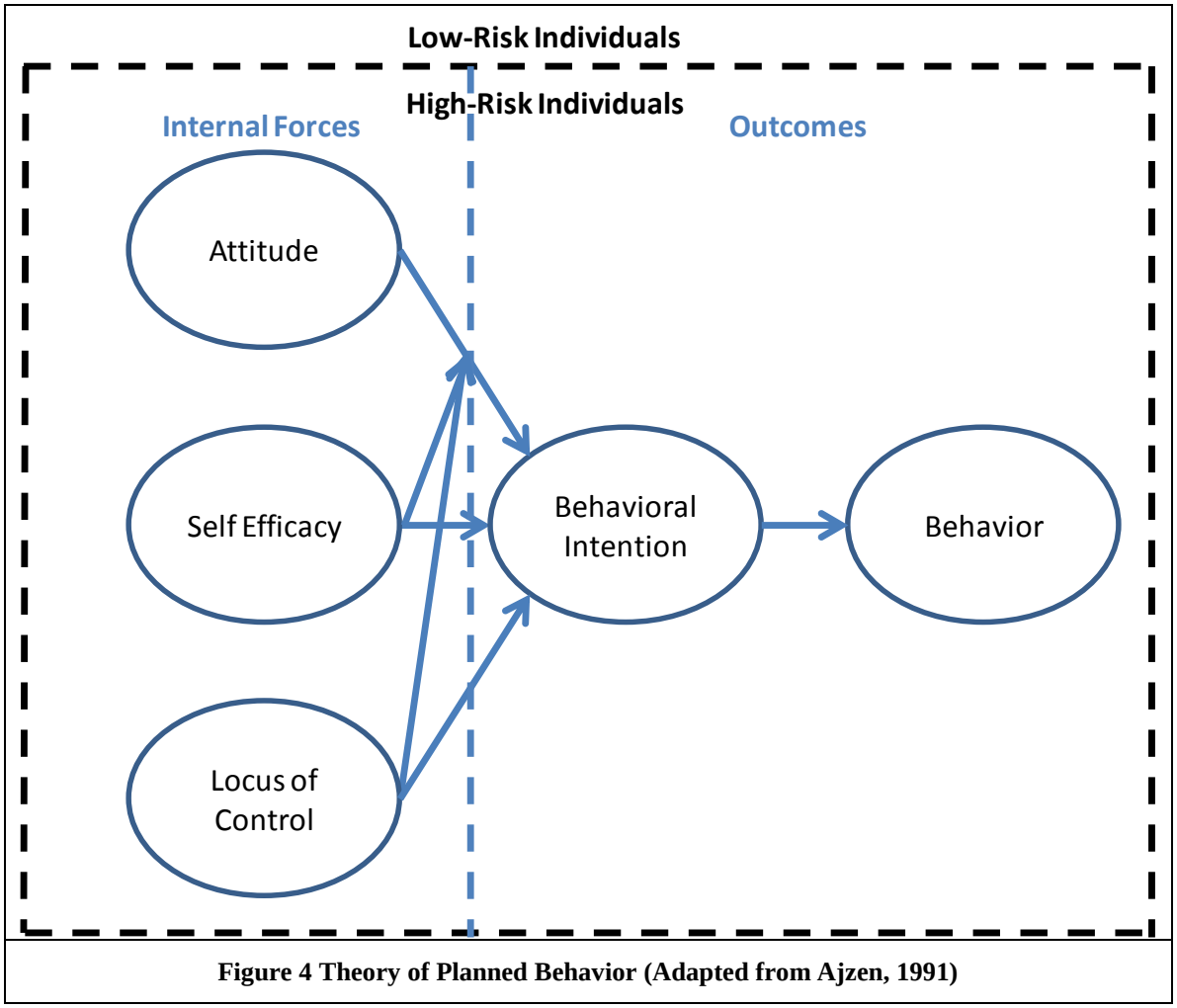

Figure 4 Theory of Planned Behavior (Adapted from Ajzen, 1991)

Attitude

An individual's attitude, either positive or negative, can change his/her behavior. The definition of attitude is "a behavior pattern, anticipatory set or tendency, predisposition to specific adjustment to designated social situations, or, more simply, a conditioned response to social stimuli" (LaPiere, 1934:230). There are two different aspects of attitude: attitude towards objects and attitude toward performing behaviors. Attitudes toward objects are the attitudes one thinks about when referring to specific symbolic objects like Mount Rushmore or an established institution. Attitudes toward

performing behaviors include the desire to visit Mount Rushmore and the desire to join an institution (Ajzen & Fishbein, 2005:174). This thesis focuses on attitudes toward performing behaviors.

A thorough investigation into the attitude construct reveals how attitudes can change individuals' behavior. Therefore, it is imperative to positively change an individual's attitude in order for a behavioral change to take place. In this thesis, application of an external cognitive-behavioral motivation technique attempts to change the attitude element which should result in a change in behavior.

Cognitive-Behavioral Motivation Can Change Attitudes

During basic training for officer commissioning programs in the United States Air Force the tradition of crossing the blue line serves as a goal-oriented cognitive behavioral motivation technique targeted at positively changing basics' attitudes. The actual event of crossing the blue line signifies the individuals' acceptance into the United States Air Force and reminds them of "their personal commitment to our nation, service, unit, and themselves" (The United States Air Force, 2010:47). Crossing the blue line facilitates a goal building process within the basics; with the basics' first goal being graduating from the commissioning program and earning their second lieutenant rank. When basics' set a goal to complete the program their attitude should positively change in respect to this goal. This positive attitude change comes from the basic internalizing the goal which changes their response to the stimuli in their environment. Therefore, if an individual wants to complete basic his/her attitude towards finishing and completing the goal should positively change.

Sherman and Fazio (1983) also note the importance of attitudes in learning. If individuals learn from consistent information flow, then specific and stable behavior occurs. Consistent information relates to correctly conveying the content of information time after time, not the regularity of timing. Sherman and Fazio (1983) also found "attitudes lead to the biased interpretation of ambiguous material as well as to selective attention to and learning of information" (Sherman & Fazio, 1983:328). Presenting information in a consistent manner strengthens attitudes and these attitudes then leads to behavior; "behavior is likely to be congruent with an attitude if the attitude has served to bias an individual's construction and definition of the situation" (Sherman & Fazio, 1983:332). By consistently implementing a goal-oriented cognitive behavioral motivation technique the material in the program can begin to form an attitude within the individual. Therefore, a consistent application of goal-based cognitive-behavioral techniques focused on changing or reinforcing individuals' task and distal goals can positively change attitudes. These positive attitudes then display an improved application of the learned material which leads to stable behavior.

H1: A goal-oriented cognitive-behavioral motivation treatment will positively change an individual's attitude towards health improvement.

A Change in Attitude Can Lead to a Change in Behavior

Ajzen's (1991) theory of planned behavior details how attitudes can lead to behavior. Attitudes are simultaneously positive or negative in response to a specific behavior because of already formed beliefs about "certain objects, characteristics, or events" (Ajzen, 1991:191). Put another way attitudes are "a learned association in

memory between an object and a positive or negative evaluation of that object, and attitude strength is equivalent to the strength of this association" (Ajzen & Fishbein, 2005:185). Individuals "learn to favor behaviors we believe have largely desirable consequences and we form unfavorable attitudes toward behaviors we associate with mostly undesirable consequences" (Ajzen, 1991:191). Therefore, individuals that have a positive attitude towards a behavior are more likely to perform the behavior. With that said, a positive change in attitudes resulting from a goal-oriented cognitive behavioral treatment can lead to a change in behavior.

With respect to healthy behavior, an individual who believes that dieting and exercise will help them lose weight possesses a positive attitude. This positive attitude then makes that individual more likely to perform the behaviors of dieting and exercising. Consequently a positive change in attitude, or a reinforcement of a positive attitude, can increase the likelihood of an individual performing the behaviors needed to improve her/his health.

H2: A positive change in an individual's attitude towards health improvement will result in improvements in healthy behavior.

Self-Efficacy

"The theory of planned behavior is an extension of the theory of reasoned action" (Ajzen, 1991:181). The main difference between these two theories is the addition of the perceived behavioral control variable. The addition of perceived behavioral control in the TPB resembles Bandura's self-efficacy construct. According to Ajzen "perceived behavioral control is most compatible with Bandura's concept of perceived self-efficacy"

(Ajzen,1991:184). Bandura's definition of self-efficacy is "concerned with how well one can organize and execute courses of action required to deal with prospective situations containing many ambiguous, unpredictable, and often stressful elements" (Bandura & Schunk, 1981:587). The similarities between perceived behavioral control and self-efficacy, according to Ajzen and Bandura, allow for interchanging of the variables within the TPB.

The definition of self-efficacy, according to Bandura, is "beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1998:624). An individual's level, either high or low, of self-efficacy in performing a task relates to behavior. Having high self-efficacy in the performance of a task may increase the probability of task performance; possessing low self-efficacy on a task may decrease the probability of task performance.

Cognitive-Behavioral Motivation Can Change Self-Efficacy

The use of a goal-oriented cognitive-behavioral motivation technique can change how individuals process their abilities to perform a certain behavior. A realistic goal requires individuals to process their abilities to perform the behaviors needed to attain that goal. For example, if the goal is losing weight the individual must feel capable in exercising and dieting. When an individual feels capable, because of a goal-oriented cognitive-behavioral motivation treatment, of exercising and dieting this is actually an increase in self-efficacy.

Analyzing a specific behavior according to its sequential tasks or goals allows individuals to assess their ability to perform each task (self-efficacy). A study of school

children's perceived self-efficacy to complete a variety of easy to difficult subtraction problems emphasizes the importance in short term (proximal) goal setting. This study found proximal attainable goal setting rather than long term (distal) goal setting heightened the child's perceived self-efficacy (Bandura & Schunk, 1981:589,595). This result is similar to Locke and Latham's (1985) hybrid view of goals. This study also found self-efficacy accounted for more variance in behavior than the variables of attitude and subjective norm (Bandura & Schunk, 1981: 591). The heightened perceived self-efficacy came from achieving small goals which increased the children's motivation. This study reiterates the need for proper goal setting as a critical part of improving self-efficacy through cognitive restructuring.

H3: A goal-oriented cognitive-behavioral motivation treatment will positively change an individual's self-efficacy towards health improvement.

A Change in Self-Efficacy Leads to Behavior

Self-efficacy may also cause behavior. For example, there is a lack of internal motivation to complete a task if individuals believe they cannot complete the task; however, individuals who think they can complete a task will be internally motivated to complete it (Bandura, 1998:624). A study by Cheung and Chan (2000) revealed "perceived self-efficacy was found to account for significant portions of variance in intentions, beyond attitudes and subjective norms, and in behavior, over and above intentions" (Ajzen,2002:672). Another study by Armitage and Conner (1999) found self-efficacy strengthens the prediction of behavioral intentions (internal motivation) and

behavior (Armitage & Conner, 1999:83-84). These two studies show that having positive self-efficacy leads to behavior.

The use of the goal-directed cognitive behavioral motivation treatment can teach individuals to subdivide a behavior (goal) into smaller, more manageable behaviors which can provide an individual who originally thought he or she could not perform a task the motivation to perform it. The internal motivation comes from a positive increase in self-efficacy. For example if an individual's goal is health improvement the use of proximal goals, like walking a mile, can internally motivate that individual (who did not think they could perform the goal) to walk that mile. Once the individual completes the first proximal goal his/her self-efficacy in completing the second proximal goal, walking two miles, increases. This cycle completes with the accomplishment of the distal goal. Therefore, the higher the perceived self-efficacy an individual has in completing a behavior the higher the behavioral intention (and hence behavior because this study did not measure behavioral intent).

Dennis and Goldberg, relating self-efficacy to weight loss, state self-efficacy is "a major determinant of one's choice of activities, the amount of effort expended in those activities, and the length of time the efforts will persist" (Dennis & Goldberg, 1996:104). Their study defined people with high self-efficacy as assureds and people with low self-efficacy as disbelievers. Assureds "were goal directed, independent, and persistent individuals who manifested feelings of self-confidence about weight control" (Dennis & Goldberg, 1996:108); whereas disbelievers "had a wavering faith in their ability to control their body weight" and tended to bypass their problems (Dennis & Goldberg,

1996:108). Both assureds and disbelievers lost significant weight after treatment; however, the individuals categorized as assureds at the beginning of the study or who switched to assured during treatment lost significantly more weight than the disbelievers (Dennis & Goldberg, 1996:106,111). These results "suggest that weight-loss treatments that support and strengthen the self-confidence of the assureds and that shift disbelievers to a more positive stance will bring about more favorable weight loss outcomes" (Dennis & Goldberg, 1996, 113). This study's results suggest that an increase in self-efficacy can lead to health improvement.

H4: A positive change in an individual's self-efficacy towards health improvement will result in improvements in healthy behavior.

Moderation between Attitude and Behavior

Self-efficacy can serve as a moderator between attitude and behavior. In the TPB self-efficacy leads to behavioral intention, which then leads to behavior (Ajzen, 2002:665); however, this thesis' did not measure behavioral intention. Instead, the interaction between attitude, self-efficacy, and behavior was modeled using self-efficacy as a moderator between attitude and behavior. In other words, an individual may possess a positive attitude towards a behavior but does not perform the behavior due to having low self-efficacy. An example is when an individual has a positive attitude to lose weight; however, does not attempt the behavior at all because s/he does not believe they can perform the actions to attain the weight loss. On the other hand an individual with high self-efficacy in losing weight strengthens (moderates) the effect a positive attitude has on behavior.

H5: A positive change in self-efficacy positively moderates the link between attitude and behavior.

Locus of Control

The construct of locus of control, also called reinforcement, has two categories: internal and external. An example of an internal locus of control is an individual who "perceives that the event is contingent upon his own behavior or his own relatively permanent characteristics" (Rotter, 1966:1). On the other hand, the definition of an external locus of control is when individuals perceive an outcome as a "result of luck, chance, fate, [or] as under the control of powerful others" (Rotter, 1966:1). Another way to think of internal and external locus of control is that individuals with internal locus of control take responsibility for an outcome while individuals with external locus of control do not take responsibility for the outcome.

According to Deci and Ryan, individuals with high locus of control have more internal motivation and are more likely to gain motivation from external rewards (Deci & Ryan, 1985:112). Examples of external rewards are coming in first place and receiving the largest end-of-year bonus. Deci and Ryan's findings show an autonomous individual or an individual who gains an internal locus of control through a cognitive-behavioral motivation treatment will react more favorably toward changing his or her behavior for a desired outcome. Other beneficial traits autonomous individuals possess are higher self-esteem, self-actualization, and ego development (Deci & Ryan, 1985: 115-116). These beneficial cognitive traits show individuals who believe in themselves are more successful and motivated.

Changing an individual's locus of control from external to internal requires a goal-oriented cognitive –behavioral motivation treatment. A goal-oriented cognitive-behavioral motivation treatment that effectively convinces an individual to set distal goals may also change an individual's locus of control from external to internal (Deci & Ryan, 1985: 112 & 131; Simons, Dewitte, & Lens, 2004: 347); because the actual process of setting goals makes the individual internalize the goal. In other words, part of internalizing the goal is acknowledging the fact that his/her behavior results in attaining or failing to attain the goal within the given time frame. The use of distal goals will allow individuals to think about what it is they want, getting healthier for example, and affectively put themselves in charge of their own destiny. This individual now realizes that health improvement depends on his/her behavior and not from external sources.

H6: A goal-oriented cognitive-behavioral motivation treatment will positively change an individual's locus of control towards health improvement.

Including the locus of control concept in the model is necessary because its traits link to internal motivation (behavioral intention), which affects behavior. The main difference between internal and external locus of control is "the perceived source of initiation and regulation of behavior" (Deci, Connell, & Ryan, 1989:113). Self-determination theory states in order for sustained behavior change, individuals must accept the specific change as their own (Deci & Ryan, 1985:131). Possessing an internal locus of control allows individuals to accept the behavior change as their own. Deci and Ryan's (1985) study showed individuals with internal locus of control "promotes self-determined functioning" (Deci & Ryan, 1985:132) or behavior. Williams et al. (1996)

echo Deci & Ryan's (1985) findings by placing emphasis on the need for individuals to internalize weight loss, behaviors. If individuals internalize weight loss they then continue to perform the weight loss behaviors resulting in weight maintenance (Williams, Grow, Freedman, Ryan, & Deci, 1996:116). The finding from Deci and Ryan (1985) and Williams et al. (1996) establish individuals that perform behaviors have an internal locus of control. Therefore, a positive change in locus of control will lead individuals to participate in healthy behaviors.

H7: *A positive change in an individual's locus of control towards health improvement will result in improvement in healthy behavior.*

When individuals possess an internal locus of control, this element can serve as a moderator between attitude and behavior. As stated previously a positive attitude can change behavior; however, if individuals also believe that their behaviors directly affect an outcome (internal locus of control) this will strengthen or moderate the effect a positive attitude has on behavior. A weight related study conducted by Holt, Clark, and Kreuter (2001) found locus of control can predict attitudes and subsequent behaviors (Holt, Clark & Krueter, 2001:336). Since locus of control can predict attitudes it is then reasonable to believe that an internal locus of control can moderate the relationship between a positive attitude and behavior.

H8: *A positive change in locus of control positively moderates the link between attitude and behavior.*

Health Behavior Leads to a Change in Health

Behaviors like maintaining a healthy diet, exercising regularly, using the scale twice a week, and counting calories can lead to health improvement. In fact these behaviors can lead to an individual losing .5kg per week in a 16-20 week study (Brownell & Wadden, 1992:509). Since being overweight or obese increases the risk of diabetes, hypertension, high cholesterol, and coronary heart disease decreasing an individual's weight also decreases these risks; by decreasing these risks individuals achieve a health improvement. Therefore performing behaviors that are specific to health improvement should improve individuals' health.

H9: A positive change in healthy behavior leads to a positive change in health.

Conclusion

The use of cognitive-behavioral motivation techniques that can positively change cognitive variables is important in the formulation of a behavioral intention. The cognitive elements that motivation can affect are attitude, self-efficacy, and locus of control. With positive increases in these cognitive elements a long term rather than short term behavior change may result.

In summary, the literature shows that proper cognitive-behavioral motivation can cause cognitive restructuring. Cognitive restructuring then results in sustained behavior in individuals. Sustaining behavior allows for a long term change in health via the cognitive element's various mediating affects. This thesis studies how a goal-oriented cognitive-behavioral motivation can cause cognitive restructuring leading to a change in health.

III. Methodology

Study Overview

The Health and Wellness Center (HAWC) located at Wright Patterson Air Force Base (WPAFB) designed and performed the study used in this thesis. The study, *Effects of Dietary, Exercise, Motivational Interventions, and Goal-Setting Strategies on Positive Lifestyle Change and Reducing Health Risk Factors among Civilian Personnel with Various Disease Risk Parameters* (2009), originated due to poor health statistics released from Civilian Health Promotion Services (CHPS). CHPS classified 33.4% of the 11,500 civilians on base as overweight and of those classified as overweight 14.6% were obese and 3.8% were morbidly obese; CHPS also found that 43% of the civilian population was over the age of 49 and estimated finding at least one known high risk factor in 29.4%-45.6% of the civilian base populous (Schlub, Moore, Elshaw, Jacobson, Papio, 2009:2). The high-risk factors for the HAWC study include: blood pressure > 140 mm Hg/90 mm Hg, total cholesterol > 240 mg/dL, body mass index (BMI) >30, fasting blood glucose > 140 mg/dL, waist > 40 inches in men or > 35 inches in women, smoking, and aerobic exercise less than twice a week. The HAWC performed this study to determine if educational classes coupled with a goal-based cognitive-behavioral motivation treatment could decrease the health risk of the base civilians categorized as high-risk.

Research Design

Figure 5 shows the research design employed in this study. The O stands for periods of observation at time one (T1), time two (T2), and time three (T3). After the T1 observation the participants were randomly assigned (R) to either the cognitive-

behavioral motivation treatment group or to the observation group (please refer to the Assignment section of Ch. 3 for more details into how the participants were assigned). The X delineates the group that underwent the cognitive-behavioral motivation treatment. With the use of this research design any differences exhibited between the two groups are caused by either the cognitive-behavioral motivation treatment or from random errors (Patten, 2009:89).

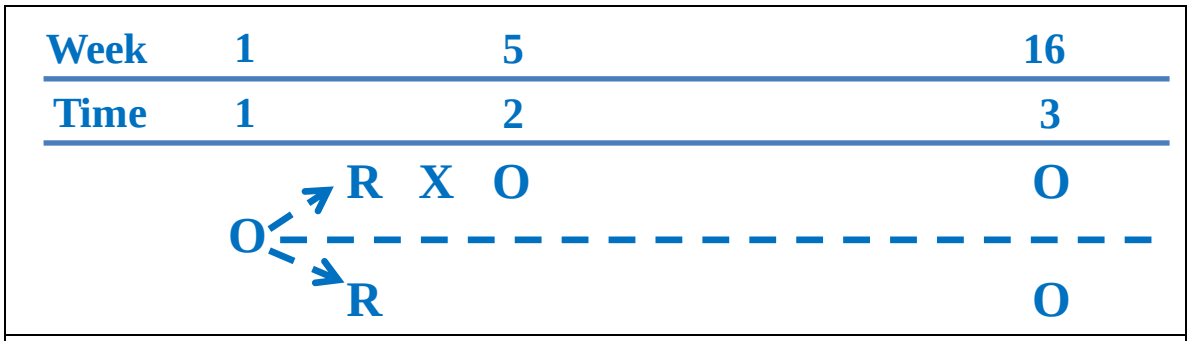

Figure 5 Research Design for HAWC Study Developed from Patten, 2009

The physical measurements observation at T1 began the study. The T1 behavior/motivation survey occurred after the participants took their first class (either standard nutrition or standard exercise). The random selection of participants to the cognitive-behavioral motivation group or to the control group happened after the T1 data collection. Directly after the cognitive-behavioral motivation treatment, 5 weeks into the program, the participants in the treatment group took the T2 motivation survey. Due to the civilian union rules on WPAFB the T2 motivation survey could only be given to the cognitive-behavioral motivation treatment group. The final observation, T3, was at the end of the sixteen week program and included both the physical measurements as well as the behavioral/motivation survey.

Approval to Conduct Study

The HAWC gained approval through the Medical Center Institutional Review Board (IRB), public affairs (PA), all civilian unions present on WPAFB, and the 88th Air Base Wing to conduct this study. These approvals were complete before participant selection started. Also, any individual handling or collecting the HAWC data completed the Health Insurance Portability and Accountability Act of 1996 to ensure proper management of these data.

Participant Selection

In order to recruit WPAFB civilians into the study the HAWC used posters, email, flyers, the Skywriter, other appropriate base media, and personal contact (Schlub et al., 2009:4). For inclusion into the study the civilian personnel at WPAFB had to exhibit at least two of the following "known health risk factors: blood pressure>140 [mm Hg]/90 [mm Hg], total cholesterol>240 [mg/dL], body mass index>30, fasting blood glucose>140 [mg/dL], waist>40 inches for men or waist>35 inches for women, smoking, aerobic exercise less than twice a week, and who may be at risk for increased morbidity/mortality as measured by the above parameters" (Schlub, 2009:6). Another criterion for inclusion into the study was the individuals' availability during the sampling frame which was approximately January 2010 – June 2010.

In order to confirm the individuals accepted into the study possessed two or more health risk factors the individuals filled out the health risk factor form and returned the form to the HAWC. Once the HAWC had the health risk factor form and confirmed the individual had at least two health risks factors the investigator contacted the potential

participant to explain the study's risk, benefits, and procedures. An individual received an invitation into the study after s/he acknowledged understanding of the study's risks, benefits, and procedures. After accepting the invitation into the study the 113 participants (approximately one percent of the civilian population on WPAFB) read and signed the Informed Consent Document along with filling out a medical questionnaire. In addition to having two or more health risk factors, the potential participant also had to be able to participate in physical activity and have the appropriate leave form signed by their supervisor for three hours leave.

Assignment

In order to determine if the cognitive-behavioral motivation treatment was effective, assignment of participants either to the motivation treatment group or to the control group was critical. For ease in assignment and to keep individuals identities confidential each participant received a number 100-112. Then the HAWC employees wrote the numbers on a sheet of paper, cut that paper into equal squares, and put the numbers into a hat. The employees then randomly choose 69 participants for the cognitive-behavioral treatment group and 44 for the control group. By employing this method of assignment, the HAWC study may have introduced a volunteer bias simple random sample (Patten, 2009:45-47).

Since the HAWC study required participants to volunteer for inclusion into the study it may suffer from some bias. One possible bias this study contains is individuals who signed up for the study solely for obtaining free blood results and not for becoming healthier individuals. This could have negatively biased the results by having individuals

participate in the study who did not have a goal to become healthier. Another bias that this sample may contain is individuals that are more motivated to become healthier than the ordinary civilians on WPAFB.

Manipulation Check

In order to ensure detection of the cognitive-behavioral motivation treatment given in the HAWC study a manipulation check was run. The manipulation check involved running a paired t-test between T1 mean motivation (measured in the behavior/motivation survey in Appendix A questions 1-9) and T2 mean motivation. The results from the t-test (Table 1) shows a significant difference between T1 and T2 mean motivation; however, instead of motivation improving after the cognitive-behavioral motivation treatment (T2) the t-test found motivation was significantly less than T1. If the cognitive-behavioral motivation increased the motivation the mean and t-test in Figure 8 would display as negative; a negative would display because motivation would go up at T2 in relation to T1 resulting in a negative mean (T1 mean motivation – T2 mean motivation).

The output shown in Table 1 confirms that chance did not cause the differences between the means at T1 and T2 (significance = .000). "SPSS® uses the degrees of freedom to calculate the exact probability that a value of t as big as the one obtained could occur if the null hypothesis were true (i.e. there was no difference between these means)"(Field, 2009:331). Therefore, a significance value of .000 states there is a zero percent probability that a t value of 6.146 would occur by chance; this means that the

cognitive-behavioral motivation treatment had an effect (negative) on the treatment group participants.

Table 1 SPSS® Manipulation Check between Time 1 and Time 2 Mean Motivation

Paired Samples Test									
		Paired Differences							
					95% CI				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	*df*	Sig. (2-tailed)
Pair 1	Motivation Time 1 Motivation Time 2	0.41063	.555	0.06681	0.2773	0.54395	6.146	68	.000***

Power Analysis

Structural Equation Modeling, a type of regression, tested the nine hypotheses and six variables established in Chapter 2 (Figure 3). To obtain the ideal power of .80 using an alpha of .05 and a six variable multiple regression technique 97 individuals were required to participate in the study to detect a medium effect size (Cohen, 1992: 158). Since the HAWC study had more than 97 participants, 113 exactly, the researchers have ample power to identify medium or larger effect sizes.

Measurement and Operationalization of Variables

Independent Variable

The independent variable in the HAWC study was the cognitive-behavioral motivation treatment. In the HAWC study the participants that underwent the cognitive-behavioral motivation treatment received a one as their designator, whereas the control group received a zero as their designator. Using a 1-0 designation allowed for statistical testing, using the HAWC's research design.

The cognitive-behavioral motivation treatment was a briefing given to the treatment group. Approximately twenty participants attended each brief during week five of the program. The briefing was goal based and focused on creating a positive change in the participants' attitude, self-efficacy, and locus of control.

Attitude - Dependent Variable

A ten question Likert-scale survey measured the attitude variable. The previously validated Likert-scale survey questions created by Watson, Clark, & Tellegen (1988) measured positive affect which can serve as a proxy for attitude (Lowe, Eves, & Carroll, 2002:1249). The Positive and Negative Affect Schedule (PANAS) is "highly internally consistent, largely uncorrelated, and stable at appropriate levels over a 2-month time period" (Watson, Clark, & Tellegen, 1988:1063). This thesis only used the positive affect questions because they can better predict exercise intention and behavior (Lowe, Eves, & Carroll, 2002:1249).

Self-Efficacy – Dependent Variable

Eight Likert-type survey questions given at the pretest and final posttest to all participants in the study measured the self-efficacy variable. Chen, Gully, & Eden (2001) validated the eight self-efficacy questions found in this survey. The survey questions focus on general self-efficacy (GSE) which is "individuals' perception of their ability to perform across a variety of different situations" (Judge, Erez, & Bono, 1998: 170). GSE influences state or task self-efficacy (SSE). SSE is "a proximal state that positively relates to individuals' decisions to engage and persist in task-related behavior" (Chen, Gully, & Eden, 2001:67). The new GSE (NGSE) scale developed by Chen, Gully, &

Eden (2001) is internally consistent, stable, and has higher content and predictive validity than the previously benchmarked 17 question self-efficacy scale (Chen, Gully, & Eden, 2001:77).

Locus of Control – Dependent Variable

Eight Likert-type survey questions measured the locus of control variable. Levenson (1981) developed the questions and estimated the reliability scores for the questions used in this study. The reliability scores ran by Levenson equal .64 and .78 (Levenson, 1981:23). Levenston found these questions to contribute to the understanding of the locus of control construct in individuals (Levenson, 1981:55).

Behavior – Dependent Variable

The participants in the study kept logs detailing their exercise and nutrition during the study. The following variables were collected in those logs: days at or below recommended calories, days eating five servings of fruits and vegetables, days of drinking five glasses of water, days of receiving 25 grams of fiber, days 20 minutes of exercise, days strength training, and days 10,000 steps. These data account for the behavior variable during statistical testing.

Because there was no *a priori* justification for these seven variables fully and equally representing the construct of behavior, the researchers created a composite variable to analyze these data. The composite variable consisted of the sum of the standardized scores of five behaviors. The exclusion of days at or below recommended calories and days strength training occurred because they proved unstable. The

researchers used standardized scores because the metric of each item, though standardized, had a different meaning for each item.

Health –Dependent Variable

Certain measurements of the body are indicative of health. The variables chosen for this study to represent health were abdominal circumference (AC), body mass index (BMI), and abdominal height (AH). Refer to the Procedures for Anthropometric Measurements taken during Pre-Screening Testing section for more information.

Because there was no *a priori* justification for these three variables fully and equally representing the construct of health, the researchers created a composite variable to analyze these data. The composite variable consisted of the sum of the standardized scores of the three items. Standardized scores were used because each item was collected using a different metric.

Data Manipulation

The data input into AMOS does not reflect the actual Likert scale number assigned by the participants for each question. Instead the data input for each question was the difference between the T3 behavior and motivation survey's Likert scale result and T1 behavior and motivation survey's Likert scale result. Since the researchers were most interested in the variable's change over time, inputting the data using the change allowed for ease in understanding the significance or non-significance attributed to change. Two variables, behavior and health, had some deviation from the standard difference between T3 and T1.

The HAWC administrators did not record behavior data at T1 for the seven behavior measures: days at or below recommended calories, days eating five servings of fruits and vegetables, days of drinking five glasses of water, days of receiving 25 grams of fiber, days 20 minutes of exercise, days strength training, and days 10,000 steps. As a result, the behavior variable required no difference computation. The researchers calculated the behavior variable as a sum of each standardized behavior measure.

The health variable was reverse-coded (changed from negative to positive) for ease in interpretation of the results. The reason the health variable was reverse-coded was due to a positive change resulting in a negative outcome. A negative resulted because an increase in health was measured by a decrease in AC, AH, and BMI; thus taking the difference in health at T3 in relation to T1 should produce a negative number that represents a positive outcome. Accordingly the structural equation model shows the overall change in results from start to finish; however, the data contained some missing values.

Survey Validation

A Confirmatory Factor Analysis (CFA) validated the survey questions developed by Watson, Clark, & Tellegen (1988), Chen, Gully, & Eden (2001), and Levenson (1981) in this population (refer to Appendix B Figure 24 for a visual of the survey validation CFA). The CFA revealed that the survey questions' validity did not differ in this population χ^2 (95, N = 113) = 96.058, p = .45. The comparative fit indices (CFI) value of .998 shows the CFA has a good model fit (Kline, 2005:140). Last the root mean square error of approximation (RMSEA) value of .01 shows the CFA model "fits reasonably

well in the population" (Brown, 2006:83). The model fit numbers of this CFA indicate reasonable item and construct validity (Blunch, 2008:110-118; Brown, 2006:81-86).

Internal Threat to Validity

Internal threats to validity are "reasons to think that the relationship between A and B is not causal, that it could have occurred even in the absence of treatment, and that it could have led to the same outcomes that were observed for the treatment" (Shadish, Cook, & Campbell, 2002:55). After examining the nine internal threats to validity, attrition is the only threat applicable to the HAWC study. Attrition is individuals dropping out and therefore not completing the study. Attrition can threaten validity by having a different group of individuals remaining in a study in one condition versus another which could cause "posttest outcome differences even in the absence of treatment" (Shadish, Cook, & Campbell, 2002:59). The HAWC study allocated more participants into the cognitive-behavioral motivation treatment group than in the control group. The HAWC employees did this to help ensure enough finishers in the cognitive-behavioral motivation treatment group in order to run statistical analyses. The HAWC enlarged the cognitive-behavioral motivation treatment group because random assignment does not control for attrition which occurs in longitudinal studies like the HAWC study used in this thesis.

Data Collection Procedures for the Dependent Variables

Each participant was required to attend a standard nutrition and a standard exercise class for the study. After attendance in the first (either standard nutrition or

standard exercise) class each participant filled out two surveys: behavior/motivation and demographics. The participants also took the behavior/motivation survey at the end of the program and if the participant was part of the cognitive-behavioral motivation treatment the participant filled out the motivational treatment survey after the motivation treatment. For ease in understanding the time frame associated with the data collection Table 2 shows each method of data collection and the time(s) of the collection. Copies of the following surveys are located in Appendix A: behavior/motivation, demographics, and motivational treatment.

Table 2 Data Collection Method and Time

	Time 1	Time 2	Time 3
Behavior & Motivation Survey	X		X
Motivation Treatment Survey		X	
Demographics Survey	X		
Anthropometric Measurements Taken	X		X

After completion of the class, questionnaire, and survey the participant set up an appointment to go through the non-invasive pre-screening tests. The pre-screening tests required the participant to fast and refrain from exercise, caffeine, and tobacco products for three hours. The data collected in the first phase include: AC, weight (W), height (H), BMI, and AH (Schlub, 2009:1).

Procedures for Anthropometric Measurements Taken During Pre-Screening Testing

An inexpensive method that can indicate an unhealthy lifestyle is anthropometry. Anthropometry studies "the measurement of the human body in terms of the dimension of bone, muscle, and adipose (fat) tissue" (Centers for Disease Control and Prevention,

2007:1-1). Examples of anthropometric measurements include: abdominal height (height of stomach while lying down), height, weight, and abdominal circumference.

Many of the HAWC's first tests focused on obtaining anthropometric measurements. The procedures for obtaining these measurements occurred in the specific sequence mentioned with the same measurement technique for all participants. Although this thesis only focuses on AC, W, H, BMI, and AH, the HAWC study collected several other variables not used in this thesis; the procedures that follow encompass all the variables collected in order to accurately describe the collection of data.

After arrival at the HAWC each participant changed into appropriate attire, if applicable, and sat down while the investigators briefed her/him about the procedures of each test. Using MedGem the RMR was the first test conducted for the day. In order to take this test correctly the participant sat quietly, placed a nose clip on her/his nose, and positioned the MedGem over her/his mouth with a tight seal. The Welch Allyn machine then took the participant's oral temperature (BT), heart rate, and blood pressure (done after sitting for five minutes). The ACCUSTAT Genetech Stadiometer then measured the participant's height and AH. Each participant was then weighed (W) on a digital scale followed by the AC measurement. The AC measurement uses a tape measure that surrounds the body tightly at the navel; the resulting score in inches is the average of three separate tape measures rounded down to the nearest half inch. The next test uses the ANTHROPOMETER calipers to measure, three times, the iliac crest (IC) width of each participant; the results of the IC are in centimeters rounded to the nearest .5

centimeter and then converted into inches. The next step is calculating the participants BMI.

In particular, BMI is an anthropometric measurement because its formula uses the anthropometric measurements of W and H. The BMI formula equals W in kilograms divided by H in squared meters. The BMI scale is classified as follows: <18.5 underweight, 18.5-24.9 normal, 25-29.9 overweight, 30-34.9 obese grade 1, 35-39.9 obese grade 2, and ≥ 40 obese grade 3 (Flegal, Carroll, Ogden, & Curtin, 2010:236). The AC and BMI anthropometric measurements can indicate increased risk (high risk factors) for disease based on visceral fat (intra-abdominal fat) in the former and overall adipose tissue in the latter.

The next test done was the body fat (BF) analysis by the IronMan/Tannica scale; this test requires the participant to take off her/his socks and for adequate hydration of the participant. Each participant could elect to take the BOD POD test for BF as well. If elected, the participant took the BOD POD test after the IronMan/Tannica scale. Once in the BOD POD the participant needed to be quiet, sit with hands on lap, legs uncrossed, and to breathe normally The procedures for the BOD POD are as follows: the participant needed to be quite, sit with hands on lap, have her/his legs uncrossed, and to breathe normally. The next test involves the use of the Monark/MicroFit VO2 Score which measures the participant's VO_2 sub-max. The test was eight to twelve minutes long and provided a VO_2 sub-maximal aerobic fitness score.

The last part of this portion of the pre-screening involves measuring strength and flexibility. The next measure taken was the abdominal strength which was computed by

the participant doing as many sit ups as they can in a minute. Sit ups were done using the sit up board with their feet inserted under the roll pad, legs making a 45 degree angle, and hands interlocked behind the head. A full sit up was complete when the elbows touch the knees and return to the down position (shoulders touching the mat). Microfit measured flexibility by the participant sitting on the floor and reaching three times. The best measure was the score taken. The strength (S) measurement used Microfit as well; this test required the participant to stand on a platform and pull down an arm bar for ten to twenty seconds. This test provided a one max rep score. The S test was the last test conducted by the HAWC in the anthropometric pre-screening testing (Schlub, 2009:1-2). Upon completion of the sixteen week program these procedures were conducted again to obtain a measurement at the end of the study.

Summary

In order for generalization of this thesis' results the HAWC study's procedures and research design needed a thorough review. This review included a manipulation check to ensure the cognitive-behavioral motivation treatment had an effect on the treatment participants and a CFA to validate the survey questions for the WPAFB civilian population. As for threats to the internal validity of the HAWC study the only one found was attrition (accounted for in methods). After a comprehensive review of the HAWC's data, the data was found suitable for use in this thesis.

IV. Analysis and Results

Chapter Overview

This chapter examines the results obtained from the path analysis of Figure 3. First, the chapter discusses structural equation modeling (SEM), the reasons for its use, and the inputs into the final model. Second, an explanation of the final model's confirmatory factor analysis (CFA) ensures accurate measures. Third, we discuss the full SEM model. Fourth, the research SEM model with moderators tests the significance of the moderators in the final model. Fifth, an examination of the research SEM model without attitude and its fit indices shows the applicability of the modeled data. Sixth, a thorough analysis of each hypothesis' result reveals the accuracy of this thesis' model. Last, analysis of alternate models provides the concluding model. Combined, these results provide a comprehensive review of the findings.

Analysis Technique Used

The researchers chose to use Structural Equation Modeling (SEM) for the analysis of the path model in Figure 3. The software program used to run the SEM was SPSS's Analysis of Moment Structures (AMOS). SEM allowed for a more robust and accurate estimate of the model than multiple regression. Multiple regression only analyzes direct relationships between variables and may require multiple analyses; whereas SEM accounts for "intercorrelations among the criterion variables" in a single analysis (Kline, 2005:66). Therefore, the use of SEM allows for a more accurate assessment of the path model identified in Figure 3.

The data set suffered from attrition; sixty two participants finished the program out of the original 113. These missing data caused some analysis problems discussed later. Another barrier missing data imposed on the model was the inability to compute the bootstrap command to obtain the standardized standard error. Therefore, there was not enough information for computation of standardized confidence intervals (CI) for each hypothesis. Instead, CIs for non-standardized results were included in the analysis. Last the researchers had to hand compute the standardized root mean square residual (SRMR) due to missing data.

The analysis proceeded in the following six steps: a CFA, a path model, the path model with moderators, a path model without attitude, analysis of model fit, and alternate paths models. The CFA validated this thesis' six variables in the study's population. With the completion of the CFA, the next step was building a path model. The path model served as a way to confirm model fit and analyze the specific hypotheses from Chapter 2. Building the path model included testing the model with moderators included and without the attitude variable. Last, due to a surprising hypothesis, analysis of alternate models identified this study's concluding model. This six step process allowed for a thorough review of the nine hypotheses.

Research CFA Model

The construction of the research CFA model marked the first step in the model building process. The building of the research CFA model included the use of the survey validation CFA which identified the three latent variables (attitude, self-efficacy, and locus of control) and their respective validated questions, the two composite variables

(behavior and health), and the treatment observed variable. The research CFA model (Figure 6) represents the best possible fit of the data. As with all other forms of SEM analysis a comparison between the current model and the independence model occurs during the analysis. The independence model is the computer generated best fitting model which acts as a baseline of best model fit. A comparison between the default model and independence model determines how well the default model fits the data.

The research CFA model did not differ statistically from the independence model χ^2 (134, N = 113) = 132.460, p = .521. This result indicates congruence between the research CFA and the independence model (Brown, 2006: 81). Line one of Table 3 shows all fit measures of the research CFA model.

Table 3 Fit Indices

Model Name	CMIN (χ^2)	SRMR	*df*	P	CFI	RMSEA	Pclose	AIC
1) Research CFA	132.460	.075	134	.521	1.000	.000	.979	282.460
2) Research SEM	169.844	N/A	142	.055	.943	.042	.706	303.844
3) + Moderators	252.257	N/A	178	.000	.864	.061	.150	400.257
4) - Attitude	171.549	.184	144	.058	.944	.041	.719	301.549

Note: highlighting denotes the model used for hypotheses analysis

Figure 6 shows the CFA for the research SEM model without attitude. The measurement items that passed verification within the sample were the only measurement items (survey questions with errors) present in each factor (attitude, self-efficacy, and locus of control). The curved arrows attached between the errors represent correlated errors. The curved lines between each factor represent a non-constrained path (correlation) whereas straight lines (not shown in this model) represent constrained paths. The arrows pointing from the factors to the measures represent factor loadings (Kline, 2005:167). There were similarities between survey questions in both the self-efficacy and

attitude latent variables; correlating the errors of these similar questions allowed the model to correctly analyze the factor.

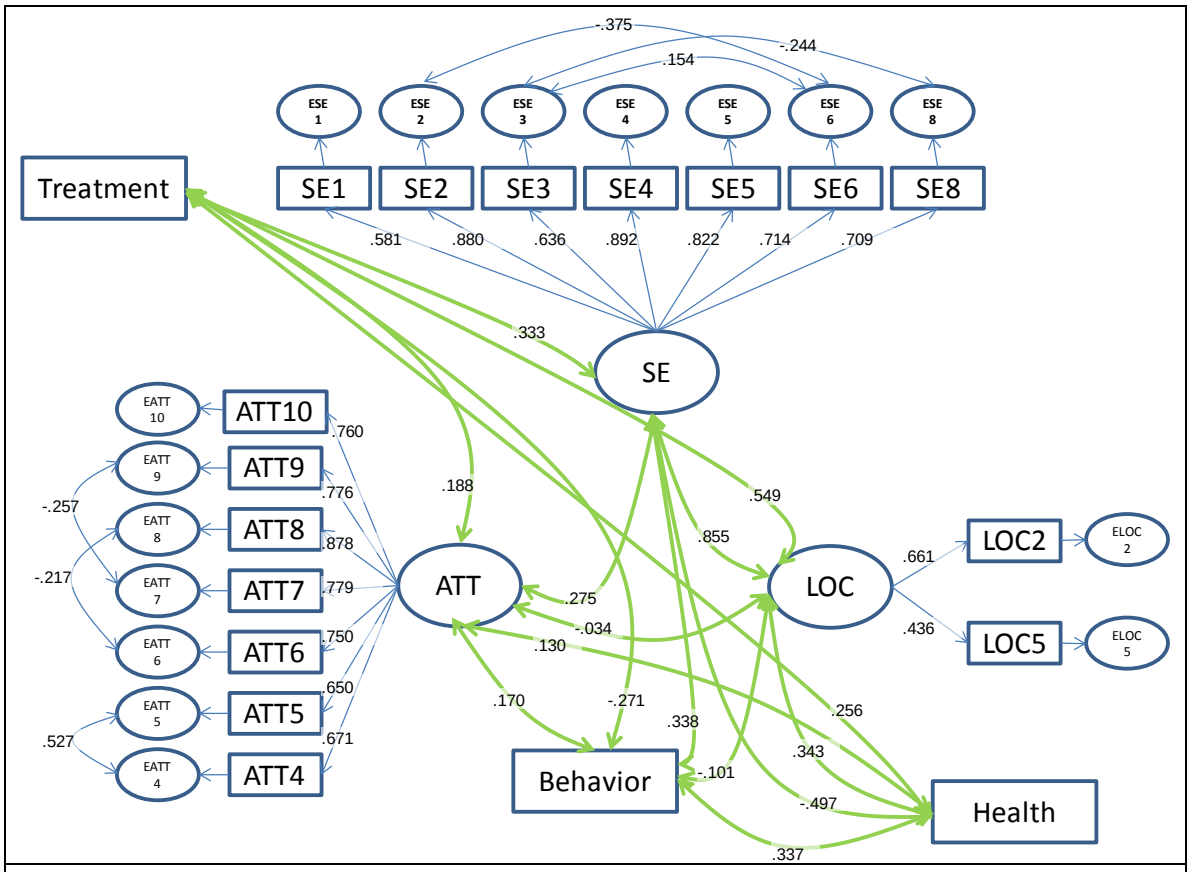

Figure 6 Research CFA Model

Notes: standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

There were three correlated errors in the attitude factor. For the attitude survey questions each participant rated how s/he felt on average in regard to each word. The first correlation was between the two words, "enthusiastic" and "proud" (questions 93-94 in Appendix A), the second between "alert" and "determined" (questions 97 and 101 in Appendix A), and third between "inspired" and "attentive" (questions 99 and 102 in Appendix A). The first pair might have correlated based on the secondary definition of

proud meaning "giving reason for pride" (Webster's Publishing Staff, 1988: 933). By interpreting proud in this manner (a secondary definition) a participant might have deduced that proud and enthusiastic were the same things causing a possible correlation. The second pair (alert and determined) might have correlated based on each definition implying an action. Last the third pair (inspired and attentive) might have correlated because each word's definition represents an admirable trait (doing one's best). The self-efficacy variable also had three correlations.

The first correlation among the self-efficacy factor was questions 21 and 25 in Appendix A. These might have correlated due to each question referring to how effective the participant felt they could perform tasks. The second correlation was among questions 22 and 25 in Appendix A. When participants read "performing effectively" and "obtaining outcomes that are important" they might translate these phrases into achieving acceptable outcomes; therefore, causing the questions to correlate. The third correlation, questions 22 and 27, might be due to achieving acceptable outcomes in various situations. Question 22 implies "obtaining outcomes" in average situations; however, question 27 specifically states "tough" circumstances. Since the first question (22) asks if a participant can achieve acceptable outcomes in average situations then a participant might infer their abilities to achieve the same outcome when times are tougher in a latter survey question (27) causing the two questions to correlate.

Research SEM Model

Producing a research SEM model was the second step in the model building process. The research SEM model (Figure 7) confirmed most hypotheses except those

related to attitude. The path from treatment to attitude was non-significant, non-standardized regression weight ((RW) = .347, p = .163, 95% CI [-.139, .833]) and the path from attitude toward behavior was also non-significant (RW = .379, p = .584, 95% CI [-.979, 1.737]). This led the researchers to remove all paths to and from the attitude variable in the model. Table 3 line two shows all fit measures of the research SEM model. Figure 7 shows the standardized regression weights (SRW) attributed to each path.

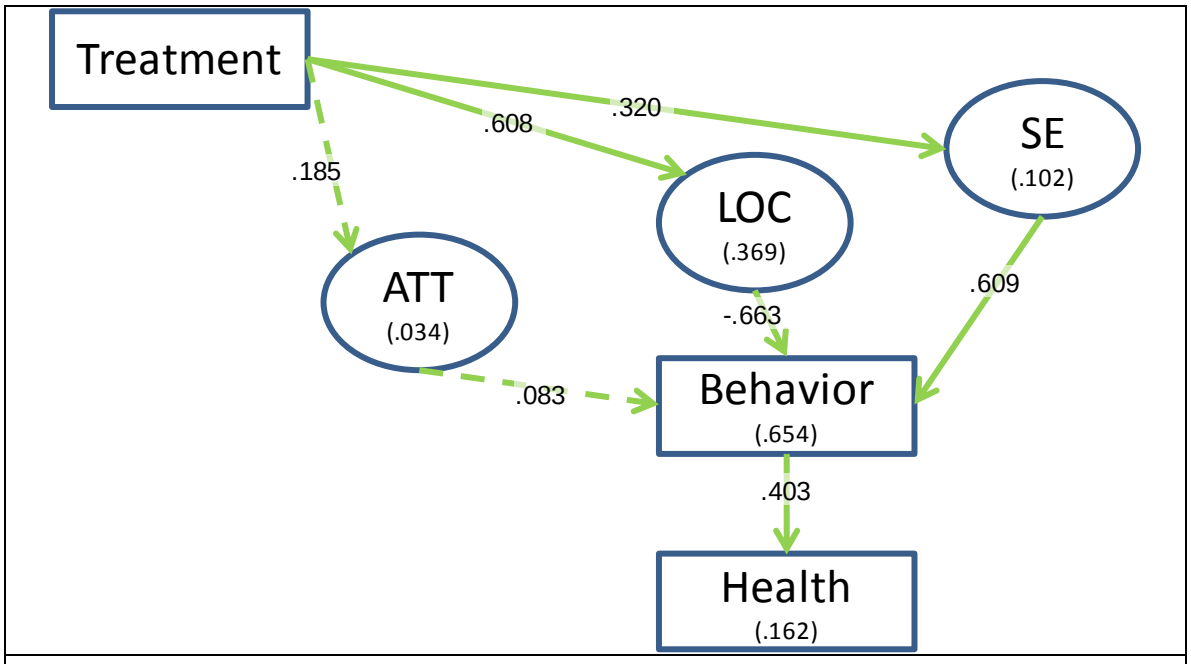

Figure 7 Research SEM Model

Notes: standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

Research SEM Model with Moderators

The third step in the model building process was introducing the moderators into the model. The research SEM model with moderators (Figure 8) appeared to confirm most hypotheses, except those related to the moderators. The path from the self-efficacy

moderator to behavior was non-significant (RW = .521, p= .706, 95% CI [-2.180, 3.222]). The path from the locus of control moderator to behavior was also non-significant (RW = .322, p = .710, 95% CI [-1.377, 2.021]). This led to the elimination of both moderators due to non-contribution to the model. Table 3 line three shows all fit measures of the research SEM model with moderators.

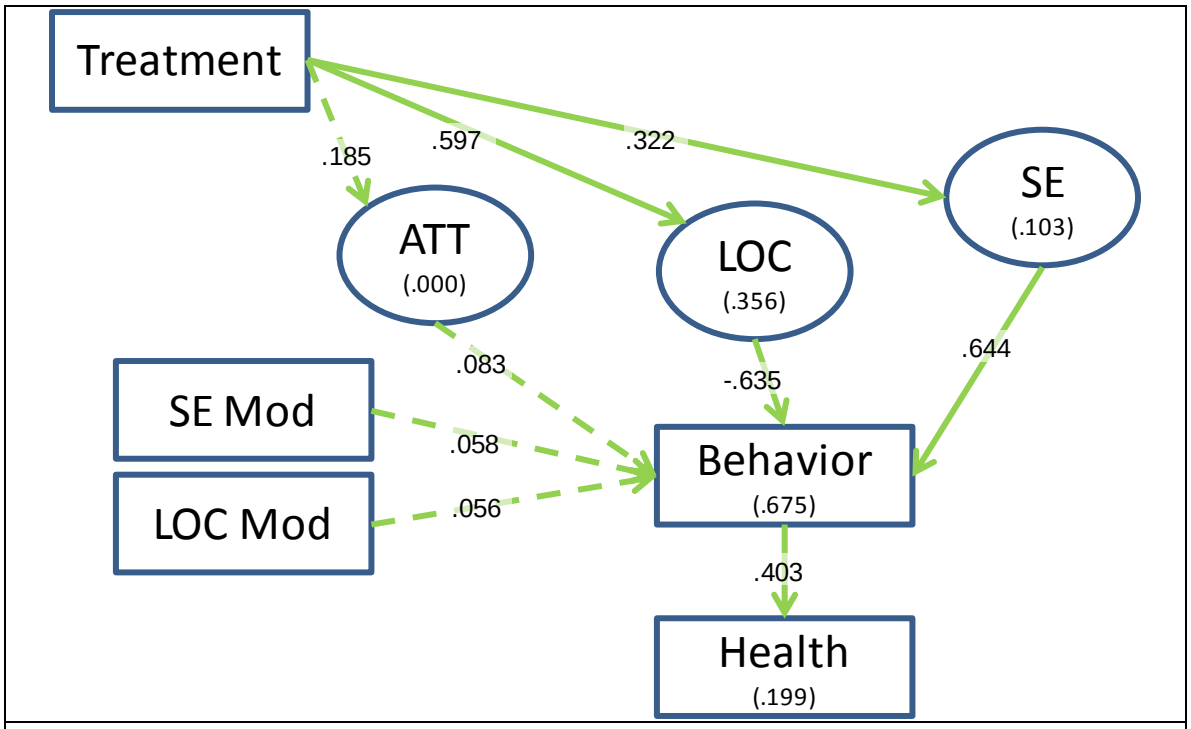

Figure 8 Research SEM Model with Moderators

Notes: standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

Research SEM Model without Attitude

The research SEM model without attitude (Figure 9) was a recursive structural regression model (Kline, 2005:74-77; 102). A recursive model has "two basic features: their disturbances are uncorrelated and all causal effects are unidirectional" (Kline, 2005:102). Figure 9 shows the research SEM model without attitude including variance

accounted for (VAF), and SRWs (Figure 25 in Appendix C shows the research SEM model without attitude including errors and not including moderators). In SEM the VAF, otherwise known as R^2, computes how much variance the model accounts for within each factor; the VAFs display below the factor names in all SEM figures. This model's exogenous variable was treatment; the endogenous variables are as follows: attitude, self-efficacy, locus of control, behavior, and health.

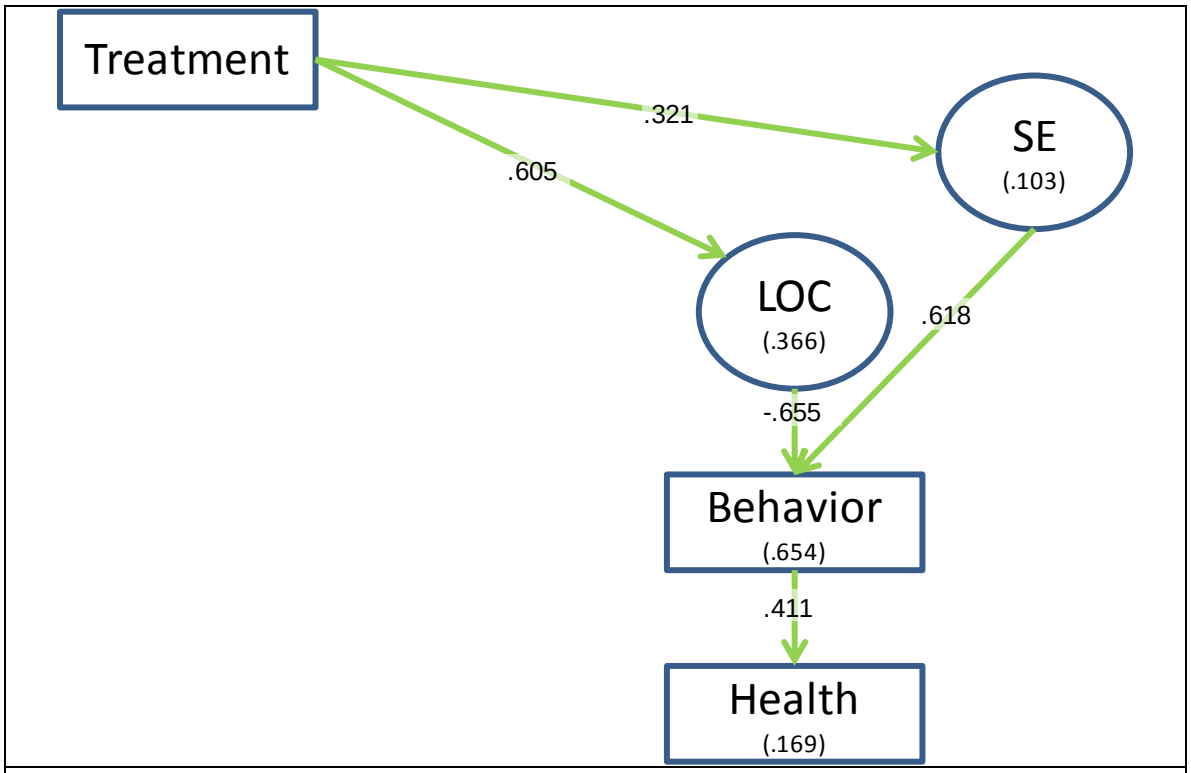

Figure 9 Research SEM Model without Attitude

Notes: standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

Model Fit

The fifth step in the model building process was analyzing the research SEM model without attitude. The research SEM model without attitude does not statistically

differ from the independence model (H_O) (χ^2 (144, N = 113) = 171.549, p = .058) indicating a good model fit. The CMIN/DF equals 1.191 which also indicates a good fit and reiterates the χ^2 non-significant p-value result (Kline, 2005:136-137). A CFI of .944 indicates a good fitting model (Hu & Bentler, 1999:27). The RMSEA equals .041 with a pclose of .719. The standard for a close fitting model using RMSEA is < .05with a p value (pclose) >.50 (Brown, 2006:83). The Akaike information criterion (AIC) equals 301.549. Given the same input matrix the model with the smallest AIC "is the model with relatively better fit and fewer parameters compared with competing models" (Kline, 2005: 142). Last the SRMR indicates a significant strain remaining in the residual matrix.

To obtain the SRMR, the researchers first obtained the sample and predicted correlation matrices. The sample matrix (Table 5 in Appendix C) came from computing the variables (all the variables used to compute the latent variables were input including the observed variables) correlations in SPSS using the Pearson correlation coefficient. The computation of the predicted correlation matrix came from the final model's AMOS output. The calculation of the residual matrix involved taking the difference of the sample and predicted matrices. The residual matrix allows for computation of the SRMR using Formula 2 (Brown, 2006:82).

$$\text{SRMR} = \text{Square Root } [(\sum r_i^2) / N] \qquad (2)$$

In Formula 2 the "r" stands for each correlation residual and the "N" equals the number of variables in the correlation matrix. A good fitting model has a SRMR of < .10

(Kline, 2005:141). The final model's SRMR equals .186. The final model's SRMR was high due to strain in the residual matrix which may have multiple causes. Unusually high strain showed in three self-efficacy questions (2, 4, & 8), the second locus of control question, and in behavior and health. Out of these five questions the health variable had the highest sum (absolute values) of the residual matrix. The high residual matrix seen in the health variable could be caused by the various methods of dieting and exercise that lead to health improvement; that is many participants' goals are to lose weight but how they lose weight varied by individual. Having variability among participants exercise and eating habits may also translate into the variability in the participants' attitude, self-efficacy, and locus of control. A participant that was successful at becoming healthier could have higher self-efficacy and a lower locus of control score than another participant that was also successful at becoming healthier.

Another possible cause of high strain in the residual matrix might be due to the use of composite variables, like health and behavior, which were incomplete measures. Since the health variable, for example, represented three different anthropometric measures of health (AC, AH, BMI) and did not include all other measures of health (like aerobic measures), the health variable was considered an incomplete composite variable. Since the composite variables were incomplete this could have added to the residual matrix strain resulting in an unacceptable SRMR. Table 3 shows the research model without attitude indices as well as the research CFA model, full SEM model, and research SEM model with moderators.

Hypotheses

H1: A goal-oriented cognitive-behavioral motivation treatment will positively change an individual's attitude towards health improvement.

The path from treatment to attitude was non-significant (RW = .347, p = .163, 95% CI [-.139, .833], SRW = .185). This result indicates there was no detectable effect of the cognitive-behavioral motivation treatment on attitudes. This may have had a couple causes: ineffective manipulation and ineffective measures. First during the cognitive-behavioral motivation treatment, the briefing did not specify the need to change one's attitude towards health improvement behavior. Instead the briefing taught the participants to change excuses for working out into positive thoughts (feeling better after working out). If the briefer had mentioned a positive attitude change toward working out would improve the participants' chances of getting healthier the results of this hypothesis might be significant. Therefore, the presentation of this item might have been unclear and difficult for the participants to draw the conclusion that their attitudes needed to change in order to modify an excuse for working out into a positive thought.

Second, non-significance of the attitude variable might have been due to the failure of the perceptual measure to properly capture the attitude variable. Ajzen and Fishbein (2005) clearly defined the difference between attitude toward an object and attitude toward behaviors (Ajzen & Fishbein, 2005:174). This study focused on attitudes towards healthy behaviors. Literature justified using a positive affect measure to represent the attitude variable (Lowe, Eves, & Carroll, 2002:1249). "A state of high energy, full concentration, and pleasurable engagement" towards life in general (an object) defines positive affect (Watson, Clark, & Tellegen, 1988:1063). By using a

positive affect measure to represent attitude this study may have captured generic attitude towards life instead of attitude towards healthy behavior (Appendix A questions 86-105). This crucial detail might have made the measure ineffective, and might explain the non-significant result of this hypothesis and the .000 VAF in attitude. Since the attitude variable seemed to capture attitude towards life, a treatment that targeted attitude toward healthy behaviors should not cause a significant change in the attitude variable; Figure 10 seems to confirm the incorrect measurement of the attitude variable. Therefore, the success of the cognitive-behavioral motivation treatment on attitude was inconclusive.

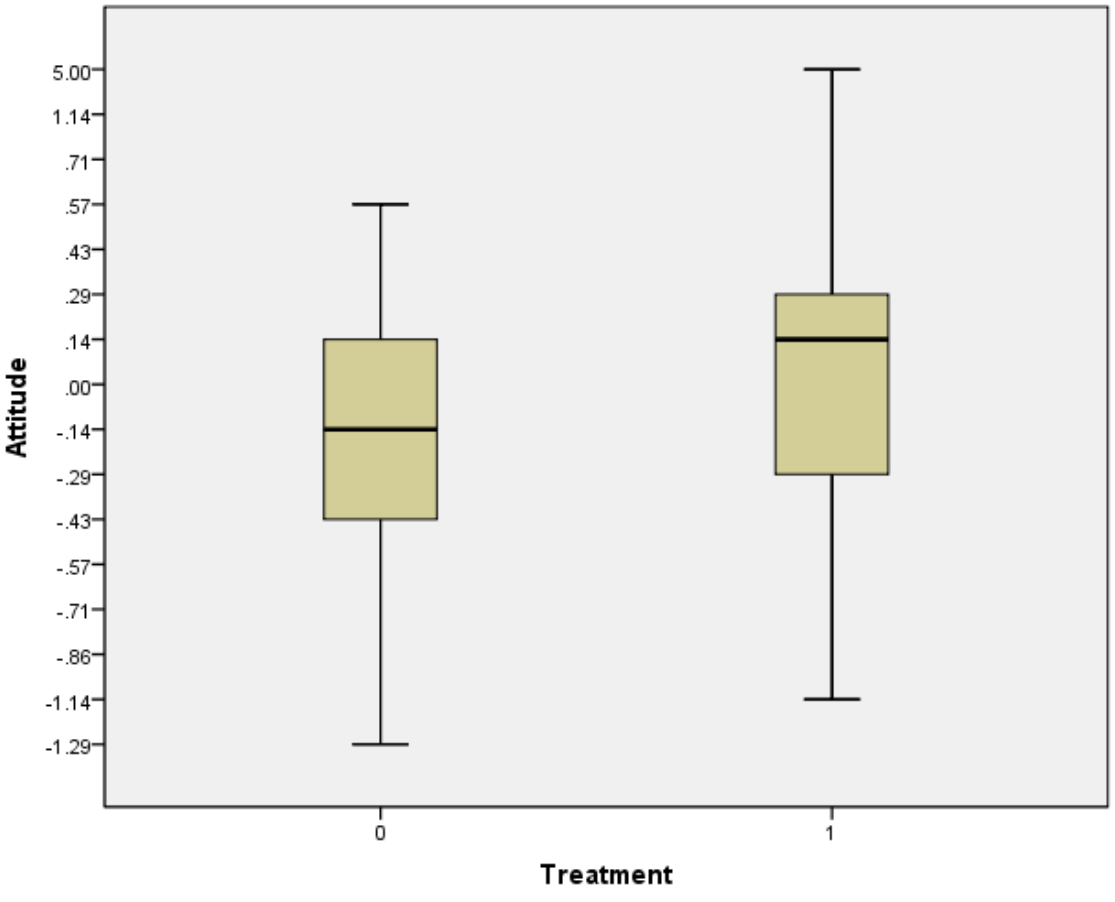

Figure 10 Treatment-Attitude Box and Whiskers Plot

Note: "0" indicates control group and "1" indicates treatment group

H2: A positive change in an individual's attitude towards health improvement will result in improvements in healthy behavior.

The path from attitude to behavior was non-significant (RW = .379, p = .584, 95% CI [-.979, 1.737], SRW = .083). On the surface it might appear that positive changes in attitude do not affect healthy behavior. Not capturing the right measure, capturing attitude towards life instead of attitude toward healthy behavior) might have caused a VAF of .000. With a .000 VAF having a significant path between attitude and behavior was almost impossible. Therefore, this hypothesis was inconclusive.

H3: A goal-oriented cognitive-behavioral motivation treatment will positively change an individual's self-efficacy towards health improvement.

The path from treatment to self-efficacy was significant (RW = .631, p = .01, 95% CI [.153, 1.109], SRW = .321). In other words, the cognitive-behavioral motivation treatment resulted in a .631unit increase in participants' perceived self-efficacy (on a 7-point Likert-type scale), versus the control group participants. This indicates that the goal oriented cognitive-behavioral motivation treatment was effective at increasing participants' self-efficacy.

The cognitive-behavioral motivation treatment focused on building and changing participants' goal of getting healthier into a proximal and distal task goal while increasing participants' self-efficacy. Increasing self-efficacy enables participants to realize that they can execute the needed tasks to meet their goal of improved health. As with Bandura & Schunk (1981), this study found that increased self-efficacy could be due to increased motivation from achieving proximal goals. This indicates that the goal oriented

cognitive-behavioral motivation briefing was effective at increasing self-efficacy through the use of proximal and distal goals.

Participants'.631 unit increase in self-efficacy caused from the cognitive-behavioral motivation treatment was not surprising. Bandura's 1977 study of treatments that induce self-efficacy, stated participants given verbal persuasion along with a way to facilitate effective performance "are likely to mobilize greater effort [behavior] than those who receive only performance aids" (Bandura, 1977: 198). The treatment group in this study was given both verbal persuasion and performance aids, where the control group was not. Thus, the significance of this hypothesis lends support to Bandura's theory.

H4: A positive change in an individual's self-efficacy towards health improvement will result in improvements in healthy behavior.

The path from self-efficacy to behavior was significant (RW = 2.733, $p < .001$, 95% CI [1.428, 4.038], SRW = .618). This indicates that for every one point increase in a participants' self-efficacy, on a 7-point-scale, that participant tends to perform 2.733 more days of healthy behaviors during the 120 day trial than the mean. The behavior variable was compared to its mean due to two causes: the measurement of this variable (in days), and the use of standardized scores. Thus, a positive increase in participants' self-efficacy tends to increase healthy behaviors.

The increase in healthy behaviors may come from increased self-efficacy caused by the cognitive-behavioral motivation treatment. This increase in self-efficacy related to the achievement and development of smaller proximal goals that led to the distal goal of

improved health. As with Armitage and Conner (1999) this study also found that improved self-efficacy does translate into behavior (Armitage & Conner, 1999:83-84). Although self-efficacy's VAF was .103 this small amount of VAF was enough to show a significant result towards behavior.

H5: A positive change in self-efficacy positively moderates the link between attitude and behavior.

The preceding analysis of moderation, shown in Table 3, Figure 11 and Figures 26 and 27 of Appendix C, was inconclusive. There are two ways to test for moderators: SEM and visual comparison of regression plots. Adding the self-efficacy moderator into the research SEM model without attitude (Figure 26) results in unacceptable fit statistics (χ^2 = 193.016, p = .043, CFI = .935) and produces a non-significant path from the self-efficacy moderator to behavior (RW = .714, p = .568, 95% CI [-1.738, 3.166). Testing the self-efficacy moderator also included checking for significance with the locus of control moderator (Figure 8 and Figure 27). Non-significance shows along the path from the self-efficacy moderator to behavior (RW = .521, p = .706, 95% CI [-2.180, 3.222]).

The second way of testing self-efficacy for moderation is using a regression plot overlaying self-efficacy (assigned three ascending groups) on a plot with attitude as the independent variable and behavior as the dependent variable (Figure 11). A conclusion of non-significance shows with the low values of R^2 = low (1) = no result, medium (2) = .031, high (2) = .093. The R^2 linear was insufficient to compare these, and lends evidence to support the lack of overall systematicity in the three regressions lines due to self-efficacy.

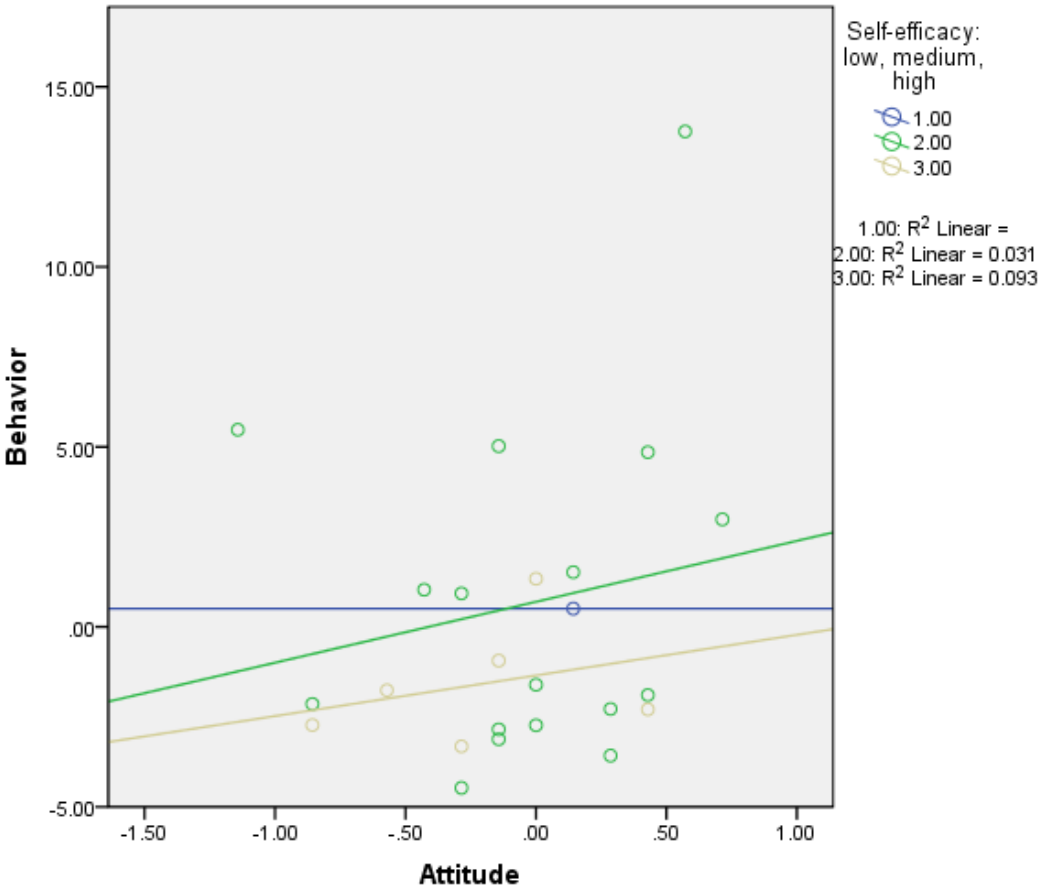

Figure 11 Self-Efficacy Moderator Graph

The non-significant finding of self-efficacy moderating the path between attitude and behavior could be due to three possible causes: the cognitive-behavioral motivation treatment, ineffective measures, and inaccurate assessment of moderation. First, in the cognitive-behavioral motivation treatment self-efficacy, although not stated by name because most people are not familiar with the meaning, was mentioned in depth without a clear connection to attitude. Without giving or implying the connection that improvement in self-efficacy can positively increase attitude's result on behavior the moderation effect could fail (as it did); however, it is also highly likely that the incorrect

measurement of the attitude variable, capturing attitude towards life instead of attitude towards health, might have caused this hypothesis to fail even if there was moderation.

Second, a VAF of .000 in the attitude variable lead the researchers to think the measurement of the attitude variable was flawed. As previously discussed the attitude variable was a problem which may have been a reason why inconclusiveness occurred. Another possible reason this hypothesis failed was an inaccurate assessment of this moderator.

Third, without the inclusion of behavioral intention, the researchers believed that self-efficacy could moderate the link between attitude and behavior if it existed. This moderation effect should have increased attitude towards performing healthy behavior by having increased task performance abilities (self-efficacy); however, the attitude variable likely measured attitude towards "life" and not towards "healthy behavior."

H6: A goal-oriented cognitive-behavioral motivation treatment will positively change an individual's locus of control towards health improvement.

The path from treatment to locus of control was significant (RW =.820, p = .002, 95% CI [.295, 1.345,] SRW = .605). Therefore, a participant included in the cognitive-behavioral motivation treatment group displays a .820 unit (on a 7 point Likert-type survey) increase in their locus of control compared to a control group participant. This indicates the cognitive-behavioral motivation treatment was effective at increasing participants' locus of control.

The goal setting cognitive-behavioral motivation treatment might be the reason there was a positive change in participants' locus of control. With the act of internalizing

a goal of becoming healthier, individuals might have increased their internal locus of control. An increase in locus of control comes from an individual acknowledging that his/her behavior alone will result in goal achievement.

H7: A positive change in an individual's locus of control towards health improvement will result in improvement in healthy behavior.

The path from locus of control to behavior was significant but negative (RW = -4.188, p = .011, 95% CI [-7.424, -.952], SRW = -.655). Consequently, for every one point increase in a participants' internal self-efficacy that participant then performed 4.188 less days of healthy behaviors than the mean. The behavior variable was compared to its mean due to two causes: the measurement of this variable (in days), and the use of standardized scores. This result does not support this hypothesis; in fact this result is the opposite of what the researchers expected.

Hypothesis seven's opposite result could be due to three causes: insufficient change in locus of control, locus of control actually decreasing healthy behavior, and an ineffective measure. First, in H6 we showed that participant' locus of control became more "internal"; the question then becomes did internal locus of control increase enough for participants to actually change their locus of control from external to internal or did the treatment just impart a small amount of internal locus of control in the participants? If a participant locus of control did change from external to internal then the participant should promote "self-determined functioning" (Deci & Ryan, 1985:132). H7's result indicates that "self-determined functioning" did not occur; thus, participants' locus of control might not have changed from "external" to "internal," but rather, just become

more "internal" which should translate into a lack of behavior (Deci & Ryan, 1985:132). Figure 12 indicates that locus of control improved ever so slightly from T1 to T3; however, the amount of improvement seems too slight to have induced behavior. Next, the researchers examined if locus of control actually decreased healthy behavior.

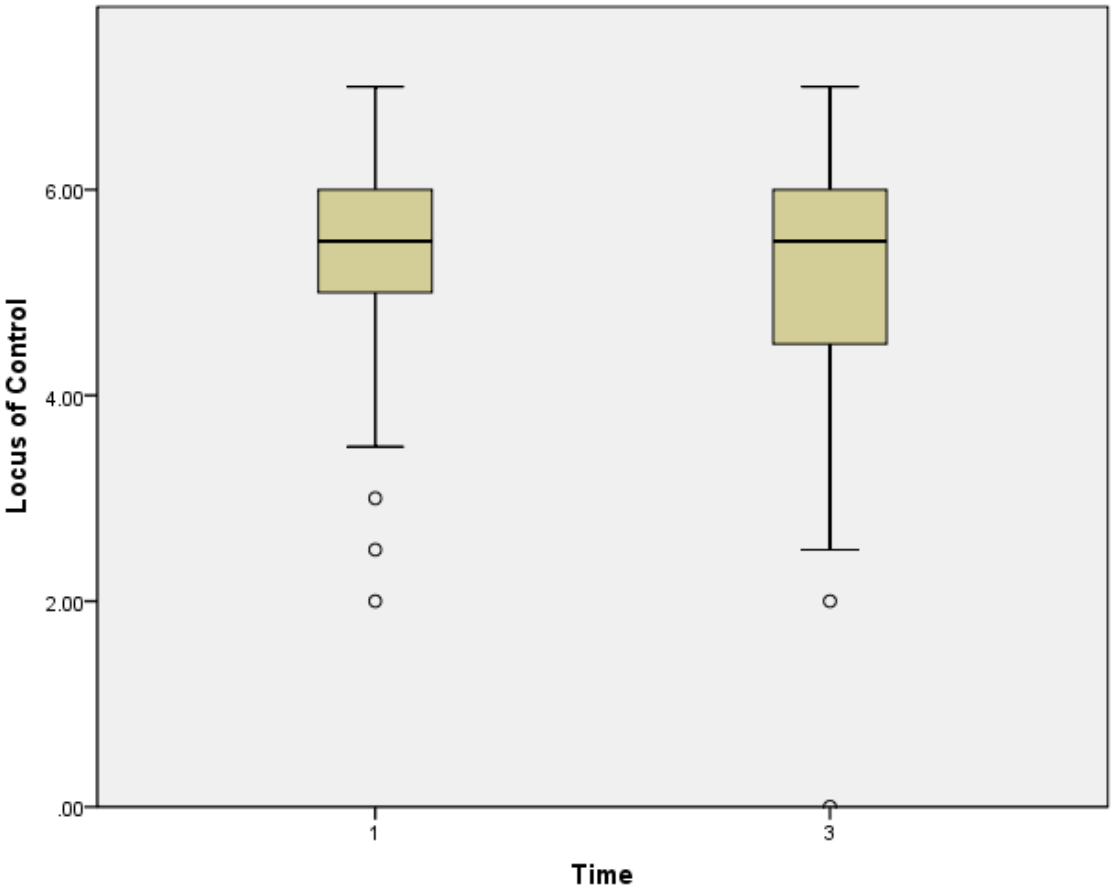

Figure 12 Time-Locus of Control Box and Whiskers Plot

Second, the measurement of the behavior latent variable included tracking the number of days a participant performed one of the following healthy behaviors: days eating five servings of fruits and vegetables, days of drinking five glasses of water, days of receiving 25 grams of fiber, days 20 minutes of exercise, and days 10,000 steps.

Measuring behavior in days or using only these behaviors might have caused an improvement in locus of control to decrease the number of days participants practiced healthy behaviors. A participant with an improved locus of control could have increased the amount of time spent exercising per workout, from 20 minutes to 40 minutes, but worked out fewer days due to doubling their time. By only tracking days of healthy behavior and not time spent working out, for example, tracking behavior by days penalized those participants who exercised for longer periods of time but did it in fewer days.

Third, a participant with improved locus of control could have also decreased or eliminated the amount of unhealthy food in their diet; however, this study did not track the number of days a participant did not eat unhealthy foods. By measuring days of healthy behavior instead of the amount of healthy behaviors (40 minutes of exercise or 30 grams of fiber) and not capturing all possible healthy behaviors an increase in healthy behaviors might show as a decrease with this measure. The alternate models section of this chapter further investigates this hypothesis.

H8: A positive change in locus of control positively moderates the link between attitude and behavior.

The preceding analysis of moderation, shown in Table 3, Figure 13, and Figures 27 and 28 in Appendix C was inconclusive. The research SEM model without attitude including the locus of control moderator (Figure 28) has a decreased fit, (χ^2 = 233.517, p = .000, CFI = .864), and a non-significant path from the locus of control moderator to behavior (RW = .554, p = .482, 95% CI [-.990, 2.098]). The locus of control moderator

path towards behavior also indicates non-significance (RW = .322, p = .371, 95% CI [-1.377, 2.021]), when tested in the final model along with the self-efficacy moderator (Figure 8 and Figure 27).

The locus of control moderator also showed non-significant in the regression plot (Figure 13). The regression plot graphs the effects of locus of control (assigned three ascending groups) on attitude (independent variable) and behavior (dependent variable). Each R^2 each group are as follows: low (1) = .017, medium (2) = .004, high (3) = .217. The R^2 linear was insufficient to compare these, and lends evidence to support the lack of overall systematicity in regression lines due to locus of control.

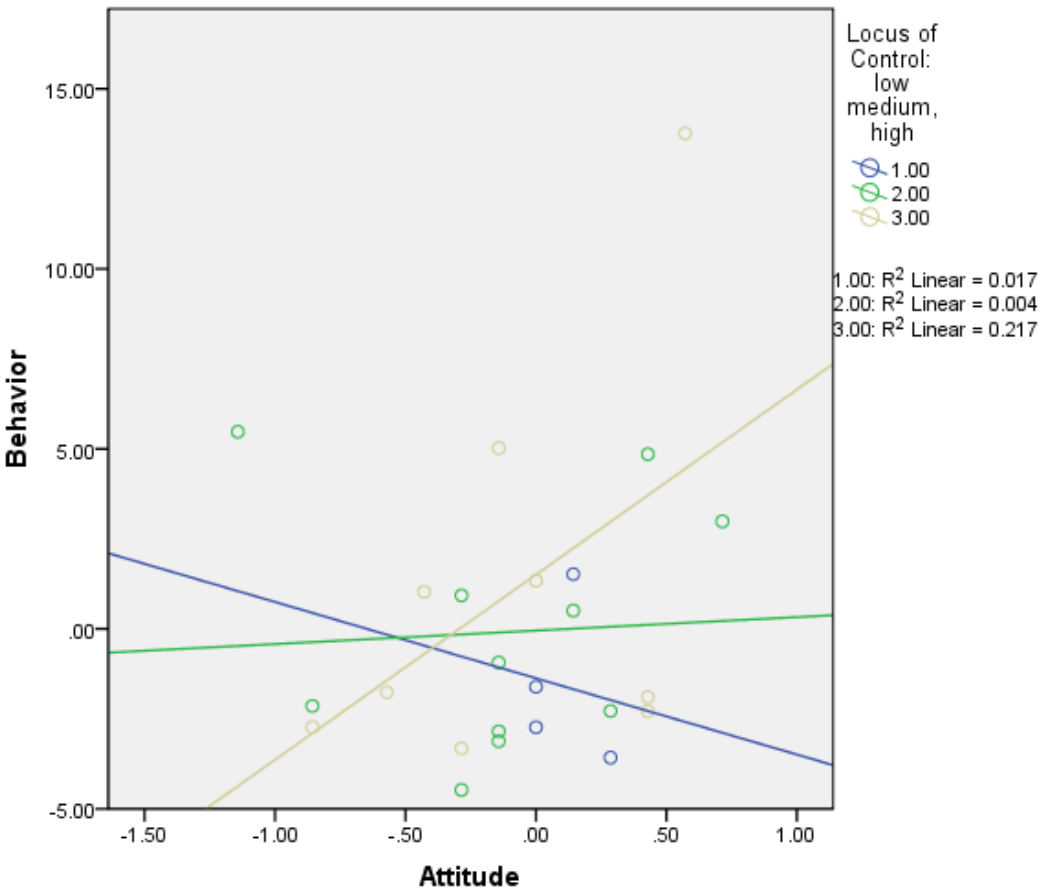

Figure 13 Locus of Control Moderator Graph

As with the self-efficacy moderator, the non-significant locus of control moderator could be due to three possible causes: the cognitive-behavioral motivation treatment, ineffective measures, and inaccurate assessment of moderation. First the cognitive-behavioral motivation treatment only implied an association between locus of control and attitude (both not mentioned by name). For example, stating an increase in taking control over time can effectively increase positive thoughts of working out (a healthy behavior) could have served as a way to make an explicit connection between locus of control increasing the link between attitude and behavior; however, the possible

incorrect measurement of the attitude variable, capturing attitude towards life instead of attitude towards health, might have caused this hypothesis to fail even if there was moderation.

Second, a VAF of .000 in the attitude variable lead the researchers to think the measurement of the attitude variable was flawed. As previously discussed the attitude variable was a problem which may have been a reason why inconclusiveness occurred. Also, if the researchers measured the wrong type of attitude (attitude towards life) this type of attitude would not translate into healthy behavior even if the participant's locus of control did change to internal. Another possible reason this hypothesis failed was an inaccurate assessment of this moderator.

Third, since this study did not include behavioral intention the researchers thought that locus of control might moderate the path between attitude and locus of control. As Holt, Clark, and Kreuter (2001) found in their weight related study, internal locus of control can predict attitudes and subsequent behaviors (Holt, Clark, & Krueter, 2001:336). Thus, increasing a participant's internal locus of control should increase positive attitude and behavior should follow; however, it is possible that locus of control did not totally change from external to internal, and the attitude variable might have measured attitudes towards life and not towards health improvement. If locus of control did not entirely change from external to internal this would not increase attitude's effect on behavior. With these complicating measures a non-significant result of the locus of control moderator was unexpected.

H9: A positive change in healthy behavior leads to a positive change in health.

The path from behavior to health was significant (RW = .232, p = .004, 95% CI [-.392, -.094], SRW = .411). Therefore, we conclude that a one day increase in a healthy behavior tends to predict a .232 increase in health. With an SRW of .411 the relationship between behavior and health seems strong; however, the modest VAF (.169) in health seems to conclude that it may take time for healthy behavior to induce a measureable change in participants' health. Therefore, this result appears to support conventional wisdom, as well as numerous previous studies, in indicating that healthy behavior may cause improvement in health.

Alternate Models

Aside from the trouble with properly operationalizing the construct of attitude, these results appear to confirm the assertions made in VIE theory and the TPB concerning the role of cognitive variables in health improvement. Having said this, the surprising result discovered in H7 led researchers to explore the data further. One way to do so is by exploring alternate models (Kline, 2005; 65)

One possible explanation was that there was a causal relationship between individuals' internal locus of control and self-efficacy (Gist, 1987: 480); i.e., increasing individuals' internal locus of control causes a positive change in self-efficacy. If this mediating effect existed, then those individuals who experienced an increase in internal locus of control, but who did not have a corresponding change in self-efficacy might explain this negative path. To test this causal relationship the researchers tested three alternate models related to this mediating relationship. Figures 14, 15, and 16 and

Figures 29, 30, and 31 in Appendix C outline the three alternate models which were compared to the best fitting model (research SEM model without attitude) from prior analysis. The researchers created the first alternate model by adding a path from locus of control to self-efficacy (Figure 14 and Figure 29 in Appendix C).

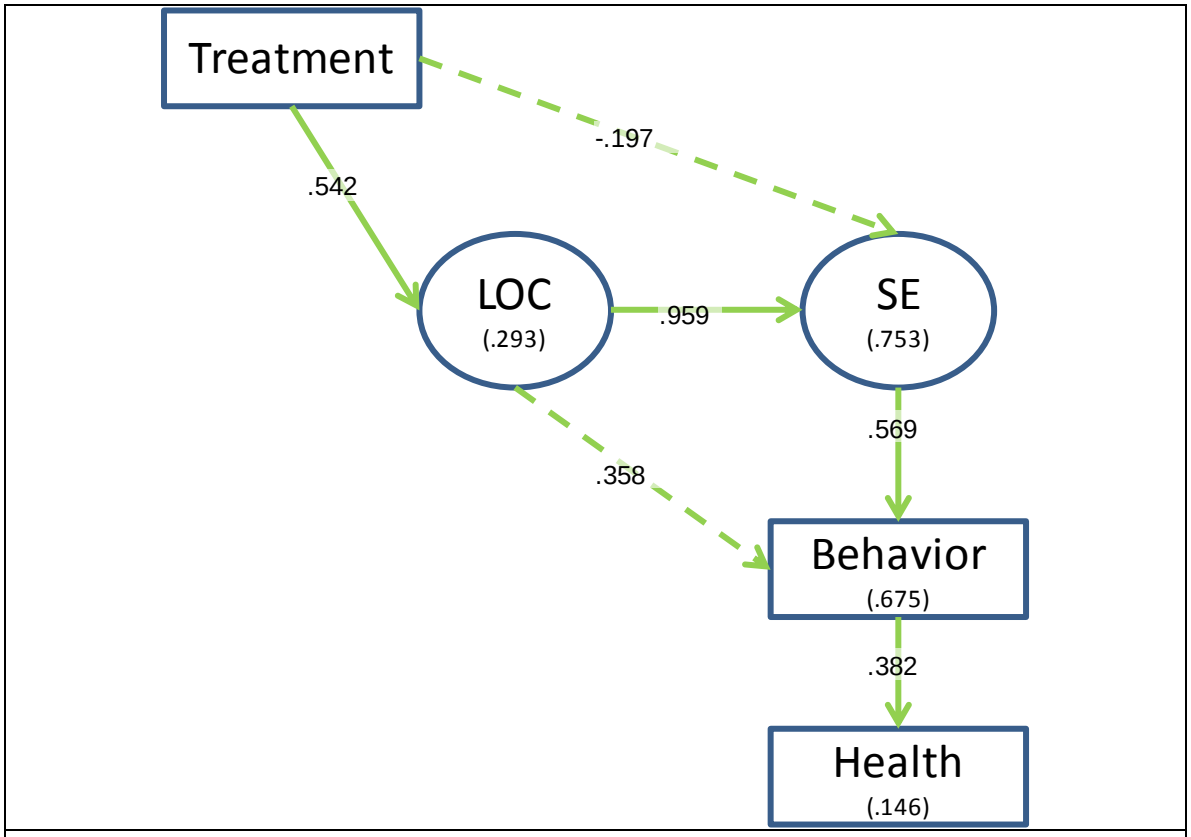

Figure 14 First Alternate Model

Notes: Standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

The first alternate model's fit statistics, shown in line two of Table 4, indicated good fit with the exception of a high SRMR. The high SRMR likely came from the use of composite variables and the added path from locus of control to self-efficacy; with these two things interacting within the model the strain seemed to pervade the entire

residual matrix without systematicity. Therefore, this model induced strain on previously non-strained variables in no apparent pattern. The two mediators are as follows: locus of control mediates treatment and behavior and self-efficacy mediates locus of control and behavior. To properly show that locus of control mediates self-efficacy, affirming Gist's causal relationship, treatment must not cause changes in self-efficacy, locus of control must not cause changes in behavior, and the path from locus of control to self-efficacy must be significant. Figure 14 indicates that the path from locus of control to self-efficacy was significant, while the paths from treatment to self-efficacy and from locus of control to behavior both indicate non-significance. Therefore, Figure 14 seems to indicate that locus of control does in fact mediate, or cause, self-efficacy and self-efficacy does mediate behavior.

Table 4 Fit Indices

Model Name	CMIN (χ^2)	SRMR	*df*	p	CFI	RMSEA	Pclose	AIC
1) - Attitude	171.549	.184	144	.058	.944	.041	.719	301.549
2) 1st Alternate	152.965	.246	143	.269	.980	.025	.929	284.965
3) 2nd Alternate	160.733	.169	144	.161	.966	.032	.870	290.733
4) 3rd Alternate	161.168	.168	145	.170	.967	.032	.878	289.168

The researchers next created the second alternate model (Figure 15 and Figure 30 in Appendix C) to validate whether the causal relationship (mediation) between locus of control and self-efficacy was full or partial (Baron & Kenny, 1986: 1177). This involved the removal of the non-significant path from locus of control to behavior. To consider full mediation the removal of the path from locus of control to behavior should cause the path from treatment to self-efficacy to increase in non-significance.

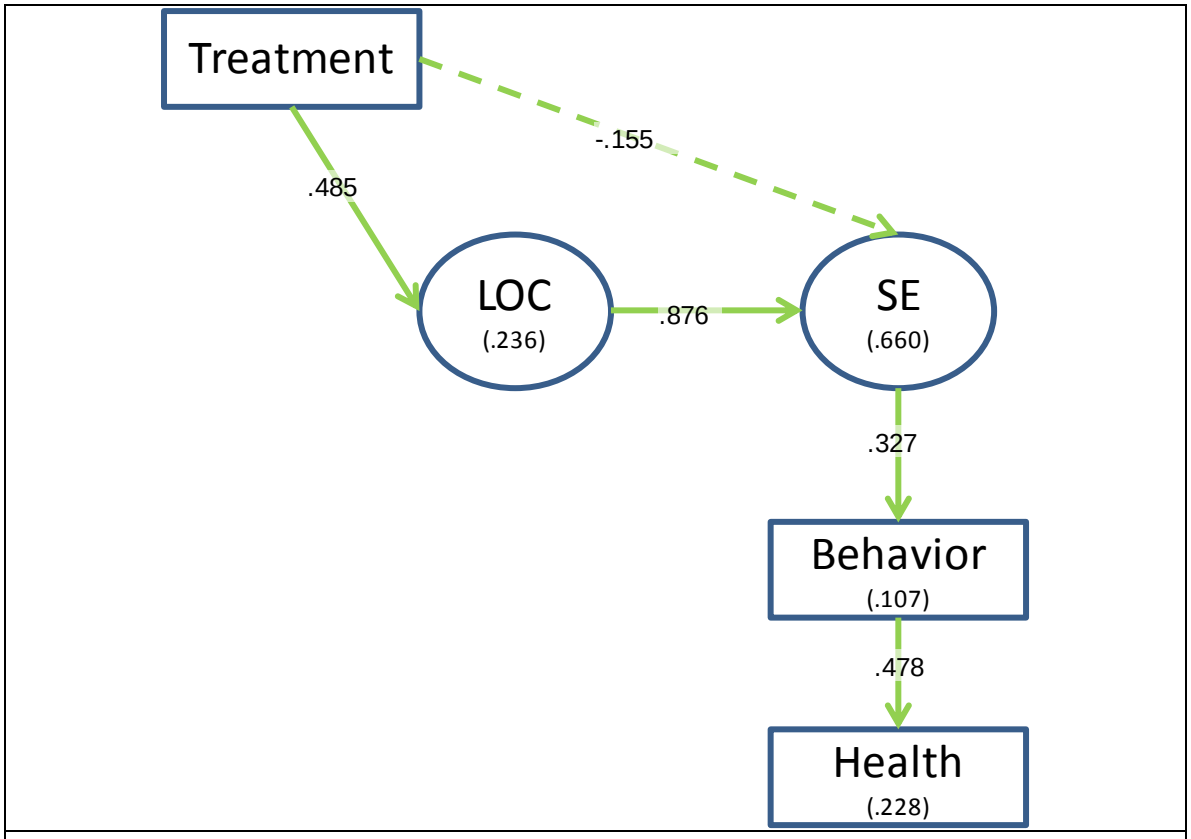

Figure 15 Second Alternate Model

Notes: Standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

The p value of the path from treatment to self-efficacy increased in non-significance from .157 in the first alternate model to .526 in the second alternate model indicating likelihood of full mediation; however, the removal of the locus of control to behavior path caused the following: VAF of behavior to fall from .675 to .107, a decrease in the VAF of self-efficacy from .753 to .660, and an increase in the VAF of health from .146 to .228. Although significant, the reduction in behavior's and self-efficacy's VAFs may indicate a lag effect; i.e., more time was required to improve locus of control enough to sustain higher self-efficacy. A strengthening of the path from behavior to health likely

caused health's VAF to increase. This path's strengthening might be due to the correct assessment of a causal relationship of locus of control and self-efficacy. If the path's strength decreased between locus of control and self-efficacy this would likely fail to verify Gist's causal relationship leading the researchers to find other possible reasons why H7's result occurred. Thus, when participants perform behavior due to an increase in internal locus of control and sustain a higher level of self-efficacy the behaviors performed tend to better predict increases in health.

The second alternate model's fit statics (line three of Table 4) indicate a good fit with a high SRMR. Again, the high SRMR likely came from the composite variables causing stress in the residual matrix. The final test for full mediation and confirmation of Gist's causal relationship involved removing the non-significant path from treatment to self-efficacy (Figure 16 and Figure 31 in Appendix C).

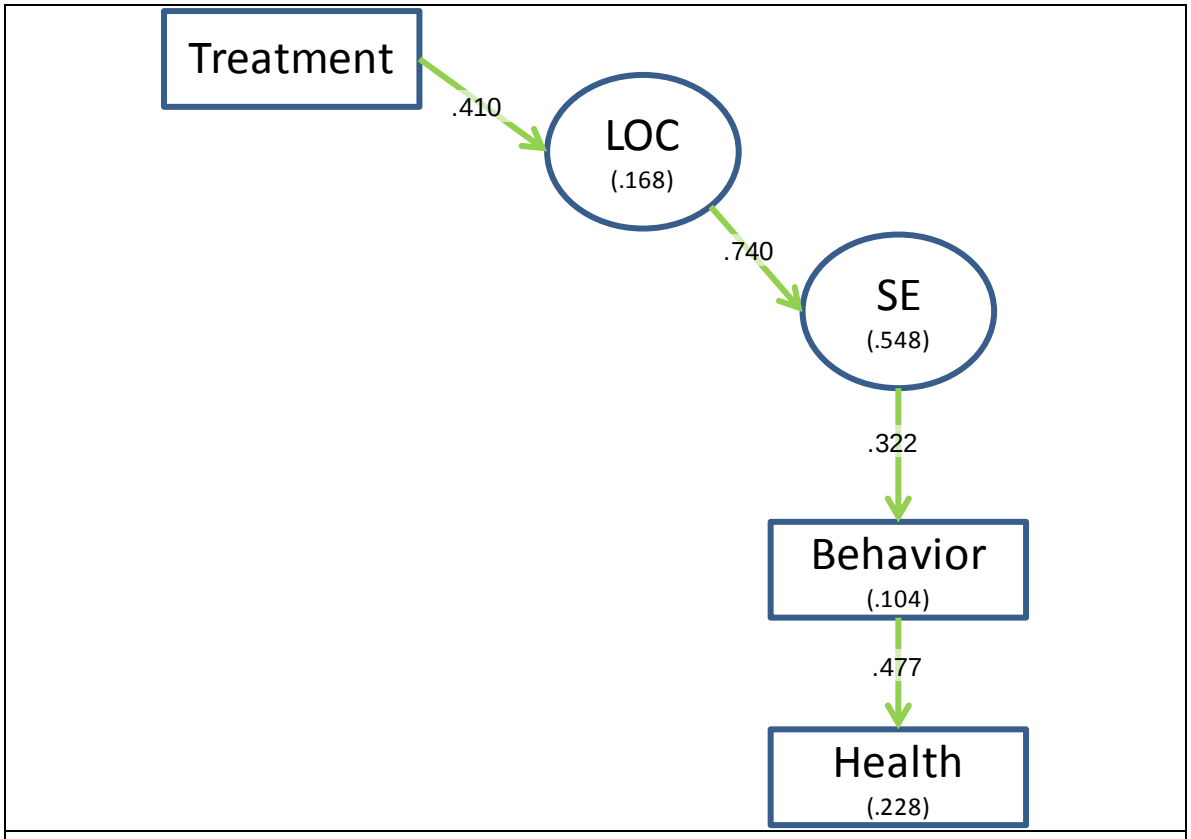

Figure 16 Third Alternate Model

Notes: Standardized regression weights shown
Measurement items and disturbances not shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

With all paths significant, Figure 16 indicates that an increase in participants' locus of control fully mediates the relationship between cognitive-behavioral motivation treatment and self-efficacy. Figure 16 also indicates that self-efficacy fully mediates the relationship between locus of control and behavior. With the removal of the path from treatment to self-efficacy locus of control's VAF decreased from .236 to .168 and self-efficacy's VAF decreased from.660 to .548. Again, a change in individuals' cognition takes time which could explain the decrease in VAF.

Line four of Table 4 displays the fit statistics of the third alternate model which indicate a good fit with the exception of a high SRMR. Since the third alternate model represents the same information as the previous two alternate models the reason for a high SRMR may lie in the use of composite variables. Next, the researchers varied their analysis of the third alternate model.

The researchers wanted to reaffirm the third alternate model's results. They did this graphing the treatment groups (1s having treatment and 0s being in the control) with respect to behavior (Figure 17). From first glace Figure 17 does not support that the cognitive-behavioral motivation treatment had an effect on behavior. Yet, due to the time it takes to impart changes in participants' locus of control which should increase self-efficacy in the long term the third alternate model mounts a more promising argument than the argument that cognitive-behavioral treatment did not have an effect on behavior (Figure 17). Therefore, imparting more than behavioral changes calls for a cognitive behavioral treatment that focuses efforts on increasing individuals' internal locus of control which will increase self-efficacy and translate into long term behavior change causing health improvement.

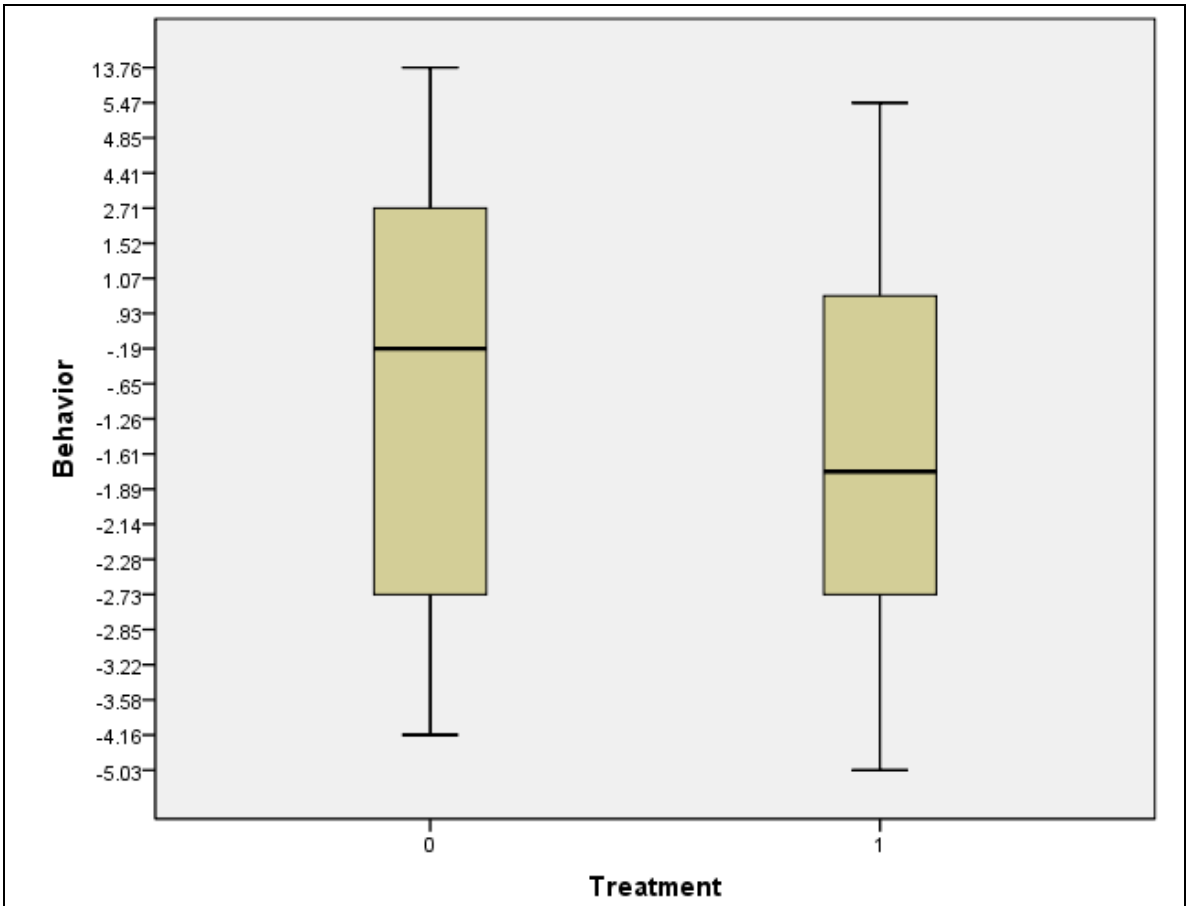

Figure 17 Treatment-Behavior Box and Whiskers Plot

Note: "0" indicates control group and "1" indicates treatment group

Hypothesis Seven's Result Explained

As in H7, the researchers analyzed the relationship between locus of control and behavior. The third alternate model seemed to support Gist's (1987) causal relationship between locus of control and self-efficacy (mediation); Figure 16 appeared to prove this point with the high path value (.740) from locus of control to self-efficacy and the positive path (.322) from self-efficacy to behavior. In the first alternate model (Figure 14) the path from locus of control to behavior became marginally significant (p = .071) whereas in the research SEM model without attitude this same path was significant (p =

.011). The change in significance of the path from locus of control to behavior caused the researchers to further explore the data.

The first step the researchers took to isolate the cause of decreased significance was to graph the relationship between locus of control and behavior with a regression line and 90 percent ellipse (Figure 18). Figure 18 shows a weak negative relationship (β = -.796, p = .323, VAF = .044) as well as three points (144, 185, and 184) that fall outside the 90 percent ellipse. These three points seemed to show extreme values (high locus of control/low behavior and low locus of control/high behavior). Another point that is well within the ellipse, but had low locus of control and high behavior was point 142. Since these four points seemed to show extreme values the researchers removed them from the data to determine if they were outliers (Field, 2009: 153).

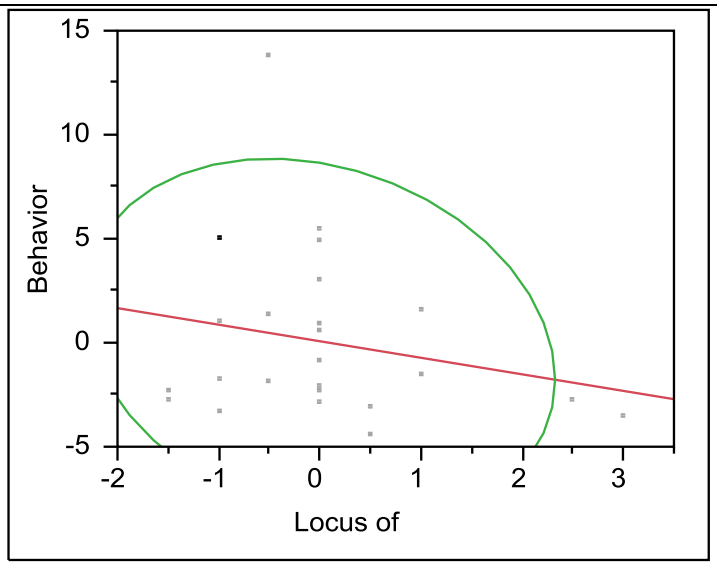

Figure 18 Locus of Control and Behavior Graph with Regression Line and 90% Ellipse

Note: The darker point indicates point 142

After removal of the four points from the data the researchers graphed the relationship between locus of control and behavior (Figure 19). Figure 19 now shows a

positive relationship (β = .600, p = .513, VAF = .024) between locus of control and behavior. The change from a weak negative relationship (Figure 18) to a weak positive relationship (Figure 19) indicates that locus of control likely did not have an effect on behavior and those extreme points were likely outliers. The significance/marginal significance the researchers detected in the research SEM model without attitude (Figure 9) and the third alternate model (Figure 16) may have been due to the outliers. Since locus of control likely did not cause behavior, this reinforced the causal or full mediation effect found in the third alternate model. The researchers then examined what occurred in those four data points or participants which caused them to become outliers.

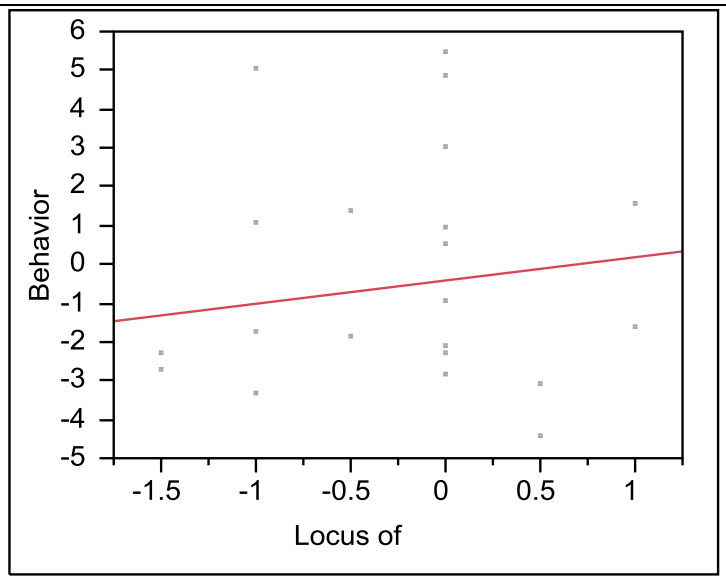

Figure 19 Locus of Control and Behavior Graph with Regression Line Excluding 4 Points

In a search for answers about those four data points the researchers first graphed the data. Figure 20 shows locus of control T1 and T3 graphed with the following three groups: all participants except the four participants with extreme values (labeled zero), the high locus of control/low behavior participants (labeled one), and the low locus of

control/high behavior participants (labeled two). After analyzing group one in Figure 20 the researchers found that the participants with lower than average locus of control at T1 had higher than average locus of control at T3. This phenomenon also occurred, in an opposite manner, for group two. Therefore groups one and two showed a regression to the mean which caused them to become outliers. Since the researchers manipulated the data to show the change in variables over time (see Data Manipulation) these points were outliers due to their larger than normal difference from T3 to T1.

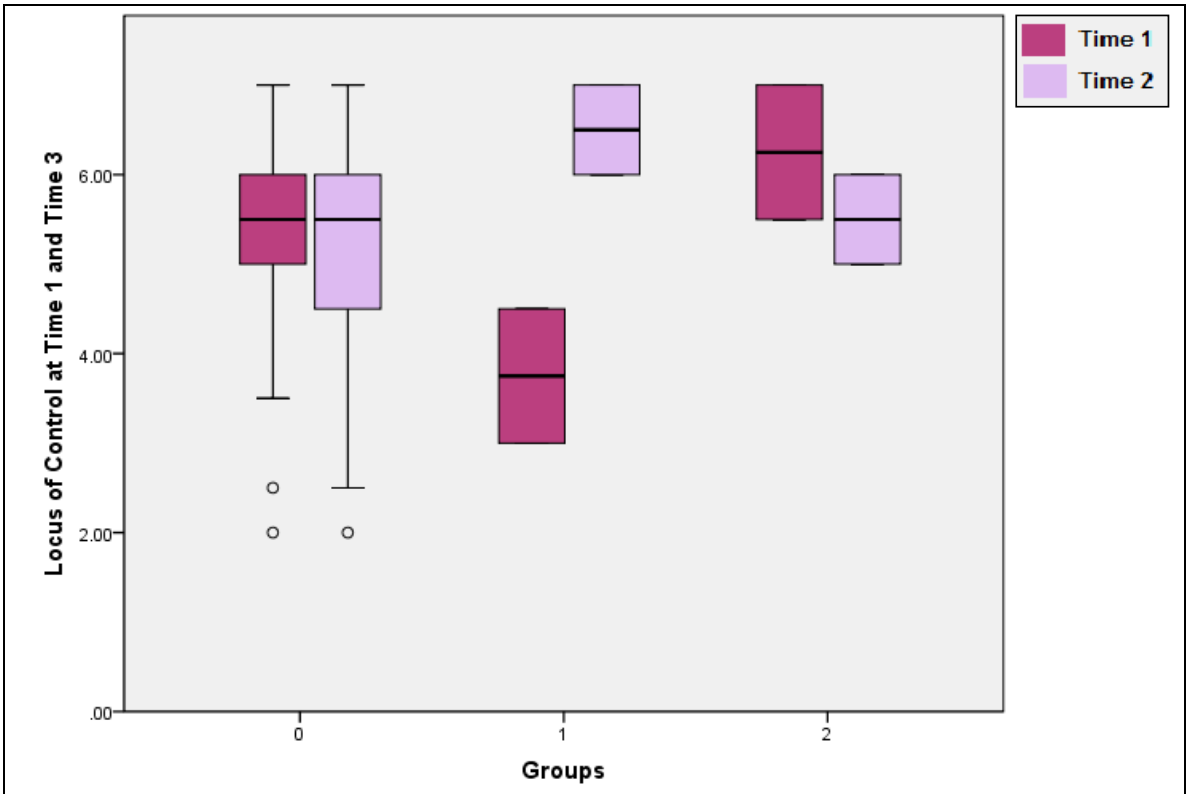

Figure 20 Locus of Control at Time 1 and Time 3 with Groups

Note: "0" indicates all participants except for extreme values, "1" indicates participants with high locus of control/low behavior, and "2" indicates participants with low locus of control/high behavior

Conclusion

The research SEM model without attitude (Figure 9) had acceptable values in the following fit tests: χ^2 test, CFI, and RMSEA; however, the model had a poor absolute fit (SRMR). The model fit indices for the final model provide adequate confidence in the hypotheses results' with exclusion of the inconclusive hypotheses (H1, H2, H5, H8). Five out of the nine hypotheses displayed as non-significant, four (H1, H2, H5, and H8) of which could have been due to incorrectly capturing the attitude variable. The rejection of H7 led the researchers to examine further theory and to apply it to alternate models.

After finding results in H7 the VIE theory could not explain, the researchers wanted to find a reason why the research SEM model without attitude found this result. The reason became apparent when a causal relationship instead of VIE theory's parallel relationship withstood rigorous testing. The rigorous testing found the third alternate model to have better fit statistics and more importantly explained the cognitive-behavioral motivation treatment's necessity in long term health improvement. Being able to better explain the importance of the cognitive-behavioral motivation treatment's effect on health led the researchers to conclude that the third alternate model surpassed the research SEM without attitude. These facts make the third alternate model this thesis' concluding model.

V. Conclusions and Recommendations

Chapter Overview

This thesis uncovered key relationships between a cognitive-behavioral motivation treatment, cognitive-behavioral variables, and health improvement. Using this knowledge effectively could lower the health care bill, improve employee efficiency and mission capability, enable longer healthier lives, and prevent premature death. This chapter reviews the key findings and limitations of this thesis as well as recommendations (practitioner and academic) and possible future research.

Key Findings

This study had two main findings. First, a cognitive-behavioral motivation treatment can positively affect cognitive changes that improve behavior and health. Second, the researchers found a causal or mediation relationship among the cognitive variables instead of the predicted parallel relationship.

This study used the VIE theory to construct the cognitive-behavioral motivation treatment. The researchers concluded that the use of a goal-directed cognitive-behavioral motivation treatment seemed to induce a positive effect on the locus of control and self-efficacy variables. The positive effect found in the cognitive variables, also called cognitive restructuring, seemed to increase healthy behaviors leading to improved health.

Second, the researchers predicted a parallel relationship among the cognitive variables due to this study's model mirroring both the TPB and the VIE theory (Figure 3). These two theories both indicate parallel relationships among the cognitive variables which should increase behavioral intent or motivational forces. Instead, this study found

a more complex causal or mediating relationship between locus of control and self-efficacy. Therefore, this thesis found that a cognitive-behavioral motivation treatment can affect the cognitive variables that induce long term behavior change; however, the way the treatment changed the cognitive variables which induce long term behavior changes was in a causal instead of a parallel manner.

Limitations

The limitations of this study stemmed from the following: theoretical operationalization, sample, research design, and measures. This section discusses each of these limitations briefly.

Theoretical Operationalization

This study did not completely operationalize the TPB and the VIE theory. Instead the researchers used the TPB and the VIE theory as starting points to build both the model and motivational briefing. Since the researchers tailored both theories to meet this thesis' specific needs, this study could not make any conclusions that either confirm or fail to confirm these theories in the personal health improvement domain.

Sample

All the participants within the sample were volunteers and at high-risk for health related issues. Since the HAWC study only included high-risk participants the findings are primarily applicable to individuals categorized as high-risk.

Research design

The research design caused several limitations including: the manipulation check, the cognitive-behavioral motivation treatment, the long term effects of the study, the

study's power, model fit, and incomplete composite variables. A limitation occurred in the manipulation check due to not surveying control participants at T2. Therefore, it was not possible to perform an immediate manipulation check for the control participants after the cognitive-behavioral motivation treatment. Instead, the researchers inferred this effect over the longer term by comparing data at T3 with that collected at T1.

Another limitation of the study design was the presentation of the same cognitive-behavioral motivation briefing in multiple sessions. Due to the schedules of participants a massive one time cognitive-behavioral motivation briefing was not feasible. Although the slides and the briefer were the same from briefing to briefing the delivery of the briefing inevitably changed. This could have occurred by someone asking a question or the briefer accidentally adding something in or leaving something out of the brief. Therefore, having a slightly different delivery from brief to brief limited the certainty that each treatment participant received the exact same brief. Even though separate briefings were a limitation, the overall treatment was effective lending support to the viability of the goal based cognitive-behavioral motivation briefing inducing change in participants. Since cognitive restructuring occurred regardless of the slight variations in the briefings, this led the researchers to believe that any similar goal based briefing can induce cognitive restructuring.

Having only four months of data to determine long-term behavior effects limited this thesis's findings. For example, because of the length of time it takes for cognitive restructuring to occur, Barkham et al. (1999) used a one year time horizon in their study of cognitive-behavioral and psychodynamic-interpersonal therapy (Barkham, Shapiro,

Hardy, & Rees, 1999: 207-208). Similarly, this study's results would have been more definitive when interpreting the second and third alternate models with a longer study (Figures 15 and 16). Thus, having a relatively short study limited this thesis's results.

Having a sample size of 113 participants, with only 62 completing the full study, may have limited the researcher's ability to find small effect sizes. Therefore, this study might not have been able to detect small, but significant, findings within the nine hypotheses and three alternate models. Power analysis indicated that 686 participants were required to detect small effect sizes (Cohen, 1992: 158). Failure to achieve this desired power may have led to the moderate instability in the results with respect to H7, as also described in Chapter 4.

Another design limitation was the lack of a census measure of health. This may have resulted in the unacceptably high SRMR. Because the primary purpose of this study was to determine if a cognitive-behavioral motivation treatment could change cognitive-behavioral variables, the health variables chosen were the relatively easy-to-collect anthropometric measurements (the purpose of this study). It is important to note that this health variable did not encompass all possible positive changes in health, e.g. blood pressure, which may have caused the strain noted in the residual matrix.

In addition to being incomplete, the behavior and health variables were composite variables (sum of standardized scores). If these variables had been more complete, and therefore modeled as latent variables instead of composite variables, the fit of all the study's models may have improved.

Survey Questions

The HAWC study used previously-validated Likert scale questions to determine participants' attitude, self-efficacy, locus of control, and motivation. Additionally, because these data used were archival in nature, the researchers were unable to change them. The inability to modify survey questions caused two limitations: likely incorrect measurement of the attitude variable, and the inability to operationalize the behavioral intent variable.

First, the possible incorrect measurement of the attitude variable limited this study to test only two cognitive variables instead of three. Therefore, the researchers could not determine whether the cognitive-behavioral motivation actually induced an increase in attitude towards healthy behavior.

Second, the archive did not include the behavioral intent variable proscribed in the TPB. Adding a behavioral intent variable would have enabled this model to show if the cognitive variables caused behavioral intent and if behavioral intent caused behavior.

Recommendations

Practitioner

Poor employee health leads to diminished productivity within the work place and increased health care costs. If a business or the United States military wanted to decrease their health care bill and reduce *absenteeism* and *presenteeism* in the work place implementation of a cognitive-behavioral motivation treatment should be one of the first steps used to reduce this risk. Organizations that specialize in health, like the Air Force's HAWC, should then have a program in place to properly implement a cognitive-

behavioral motivation treatment. The results of this study seem to indicate a properly implemented cognitive-behavioral motivation treatment includes the following: emphasis on the use of goals, process orientation, and imparting focus on small but good changes (Foster, Makris, & Bailer, 2005:230S).

This study seemed to indicate that if correctly implemented, the cognitive-behavioral motivation treatment can cause cognitive restructuring within individuals, solving the problem of reversion back to the previous unhealthy state. Therefore, use of a cognitive-behavioral motivation treatment may cause long term changes within employees who did not perform well in behavioral based weight loss programs. In an era of efficiency and lowering costs in the civilian sector as well as the military, a cognitive-behavioral motivation treatment should be the first line of defense to reduce the health care bill and increase both employee efficiency and mission capability.

Businesses, governmental organizations, and the United States military can save money by reducing AC and BMI. Højgaard et al. found the costs of health care increase when BMI and AC increase. Specifically the difference between women with normal BMIs (18.5-24.9) and normal ACs (< 31.5 inches) cost $677 (in base year 2005 dollars) less per year than obese (BMI > 30) women with a large AC (> 34.6 inches). The difference for men with normal BMIs and normal AC (< 37 inches) cost $1,162 less than obese men with a large AC (> 40 inches). Similarly the difference for women with a normal AC and BMI cost $672 less than overweight women (BMI ≥ 25 <30) with a large waist. The difference between men with a normal BMI and AC cost $751 less than overweight men with a large waist. The average health care cost for obese individuals

(both men and women) with large waists totals $919.50 whereas the average health care cost difference between individuals with normal BMIs and ACs with overweight individuals with large waists totals $711.50 (Højgaard, Gyrd-Hansen, Olsen, Søgaard & Sørensen, 2008: 4).

If a properly implemented cognitive-behavioral motivation treatment reduced individuals' BMI and AC to the normal range, then the potential savings to a base the size of WPAFB could reach $3.173 million per year in civilian health care costs. Extrapolating the CHPs percentages to the United States Air Force civilian population (145,084 civilians strong) could result in an overall savings of $40.03 million.

To successfully lower the health care bill and increase both employee efficiency and mission capability, proper implementation of a VIE theory based cognitive-behavioral motivation treatment is advised. Based on this research the treatment may wish to focus on improving individuals' locus of control and self-efficacy. The researchers determined, after analyzing Barkham et al.'s (1999) study, that one year was a sufficient study length to determine if cognitive restructuring occurred (Barkham et al., 1999: 207-208). Requirements during this year of study for participants are as follows: quarterly attendance of a cognitive-behavioral motivation treatment and having their measurements (attitude, self-efficacy, locus of control, behavioral intent, behavior, AC, AH, and BMI at a minimum) taken at the same time the cognitive-behavioral motivation treatment occurred. The researchers believe repetitive treatments could further induce and sustain cognitive restructuring. Implementing a longer program with four treatments might allow sufficient time to effectively cause long term change. Affecting a long term

positive change in health would enable these individuals to live longer healthier lives and prevent premature death.

The researchers believe that implementing a cognitive-behavioral motivation treatment, whether in-house like the HAWC or outsourced, would prove cost effective. The HAWC, for example, already provides health classes for the base populace; since the Air Force already bares the cost of the HAWC adding another class should minimally affect costs. With a low cost solution to a high cost problem, the Air Force's cost-benefit ratio should indicate a high financial incentive to initiate the cognitive-behavioral motivation treatment program.

Academic

Although the TPB and the VIE theory both contributed to this thesis' model the researchers found a fundamental difference among this thesis' result and the two theories. The two theories indicate a parallel relationship between their respective factors and this study found a causal or mediating relationship. Therefore, more research is required to further validate or disprove the TPB and VIE theory in this population.

The Theory of Planned Behavior

The TPB "was meant to demonstrate that general attitudes and personality traits are implicated in human behavior, but that their influence can be discerned only by looking at broad, aggregated, valid samples of behavior" (Ajzen, 1991: 181). In this study the researchers were trying to induce specific health related behaviors instead of broad behaviors. Given the fact that this research used the TPB as a basis and seemed

successful at predicting a specific behavior more research is required on possible mediation effects within the TPB.

To bring the TPB into the twenty-first century researchers may want to test the viability of mediation among the cognitive variables. This testing should span a wide array of different behaviors using varied causal or mediation paths (for example: attitude mediates perceived behavioral control which mediates subjective norms or perceived behavior control mediates subjective norms which mediates attitude) among the internal variables. The most recent theory of planned behavior research involved implementing the theory not manipulating its cognitive variables (Eggleston, Middlestadt, Lindeman, McCormick, & Koceja, 2011: 38-39; Omondi, Walingo, Mbagaya, Othuon, 2012: 118); this led the researchers to believe that testing of viable mediation among the cognitive variables appears to be novel. Engaging in this type of research might provide researchers better and more predictive ways to induce behavior among humans in all types of settings. Therefore, it would be advantageous to test the TPB in mediation form with SEM to see if predicting specific behaviors are possible.

Valence, Instrumentality, and Expectancy Theory

Vroom built VIE theory to help predict work motivation (Leon, 1981: 45; Dachler & Mobley, 1973: 398; Johnson, 2008: 274-275; Liao, Liu, & Pi: 2011: 252-253). This study added to VIE theory's long standing list of inconsistent finding regarding its applicability to predict behavior (Dachler & Mobley, 1973: 397; Leon, 1981: 45; Johnston, 2008: 274-275; Liao, Liu, & Pi: 2011: 252-253); however, this study did verify its goal directed technique. By using a goal directed technique, the cognitive-behavioral

motivation treatment likely positively changed the internal variables which caused healthy behavior. Since the researchers found the motivating principles of VIE theory accurate, more research should concentrate on a possible causal instead parallel relationship among the VIE theory's internal variables of valence, instrumentality, and expectancy.

Like in this thesis' study, the lynchpin of this theory might actually be a mediating relationship instead of a parallel relationship. Extensive research into using mediation along with VIE theory's proven goal-based cognitive-behavioral motivation might prove successful.

Recommendations for Future Research

This study's results imply two additional studies. First, a similar health-related study that includes an accurate attitude variable as well as a behavioral intent variable would offer further research into this thesis's findings. Second, a study that focuses on determining if a cognitive-behavioral motivation treatment effectively increases Air Force physical fitness (PT) test scores in the long term (in either high-risk or normal populations).

First Future Study

The first study is a direct follow on of this thesis' results. A study that includes an accurate attitude variable as well as a behavioral intent variable, might clarify the findings herein, as well as mitigate some of the limitations found in this study. This study would see if Gist's causal relationship, as found in this study held with the addition of the task-oriented attitude variable and behavioral intent. If the new study found a

causal relationship among all three internal variables then this would verify Gist's theory in this population; however, if this study found evidence supporting the TPB and VIE theory's parallel relationship the findings of this thesis would be questioned.

As stated previously, the findings of this study appear novel compared to current research that merely operationalizes the TPB and the VIE theory (Eggleston, Middlestadt, Lindeman, McCormick, & Koceja, 2011: 38-39; Omondi, Walingo, Mbagaya, Othuon, 2012: 118; Leon, 1981: 45; Dachler & Mobley, 1973: 398; Johnson, 2008: 274-275; Liao, Liu, & Pi: 2011: 252-253). Researchers may want to consider a twelve month study, as outlined in the limitations section that includes four evenly spaced cognitive-behavioral motivation treatments to ensure long term cognitive restructuring occurred (Barham et al., 2009: 207-208). The researchers may also want to take participants' measurements (their attitude, self-efficacy, locus of control, behavior, behavioral intent, AC, AH, and BMI) concurrently with the cognitive-behavioral motivation treatment to ensure even spacing between measurements.

Implementing changes in the behavior variable provides for a better measure of this variable. To improve the stability of the behavior variable, it should include a wide array of different behaviors and be measured in amount per day (not a simple yes or no question). For purposes of this future research the health variable could remain the same, or could include other measures of health if desired. This future research could both verify this study's results as well as extend the researchers understand of the interplay between cognitive-behavioral variables.

Comparing six alternate models, with varied mediation paths, to the model developed in this thesis might theoretically provide additional support for this model (Kline, 2005: 323). Figure 22 shows one of the six possible operationalized models of this potential mediation relationship that might lead to healthy behavior and health. With the use of an accurate attitude variable, inclusion of a behavioral intent variable, and a more robust measure of behavior, this research would better align itself with the TPB and enable a more accurate result of possible mediation.

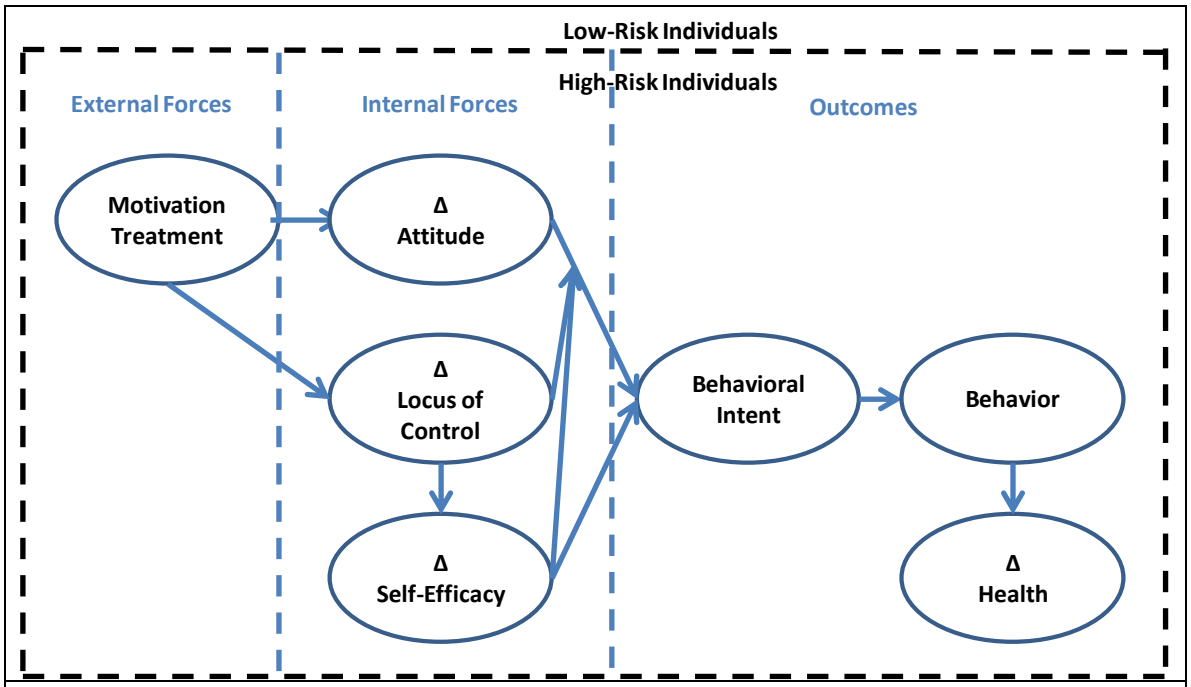

Figure 21 Future Mediation Research

Second Future Study

The second future research study could focus on determining if a cognitive-behavioral motivation treatment could positively affect Air Force PT scores in the long term. A benefits of this study, if found effective, would be an additional method to help

Airmen who struggle on the PT test or who have failed it to improve their scores, and an inexpensive method that might improve all Airmen's scores if effectively implemented. The Air Force's PT test currently consists of a waist measurement, one minute of push-ups, one minute of sit-ups, and a timed 1.5 mile run. Since the Air Force PT test includes more than anthropometric measures of health, testing to see if a cognitive-behavioral motivation treatment could positively affect PT test scores in the future would represent an extension of the scope of the health variable. In general, this study would differ from the first future study and this thesis' study because the majority of people in this program would not fall into a high-risk category for health.

Operationalizing this future research would involve using a model like the one shown in Figure 23. The researchers propose using a model that tests the original model found in this study with the inclusion of an accurate task-oriented attitude variable, behavioral intent variable, and a better measure of behavior. A better behavior variable would include a wider scope of activities and be measured in amount (for example exercise time) per day. A more robust study would include the mediation testing that the first future study proposes. A twelve month study which includes four evenly spaced cognitive-behavioral motivation treatments might allow ample time for cognitive restructuring to occur (Barkham et al., 1999: 207). Using a wider scope as a measure of health and a better behavior variable should cause less model strain.

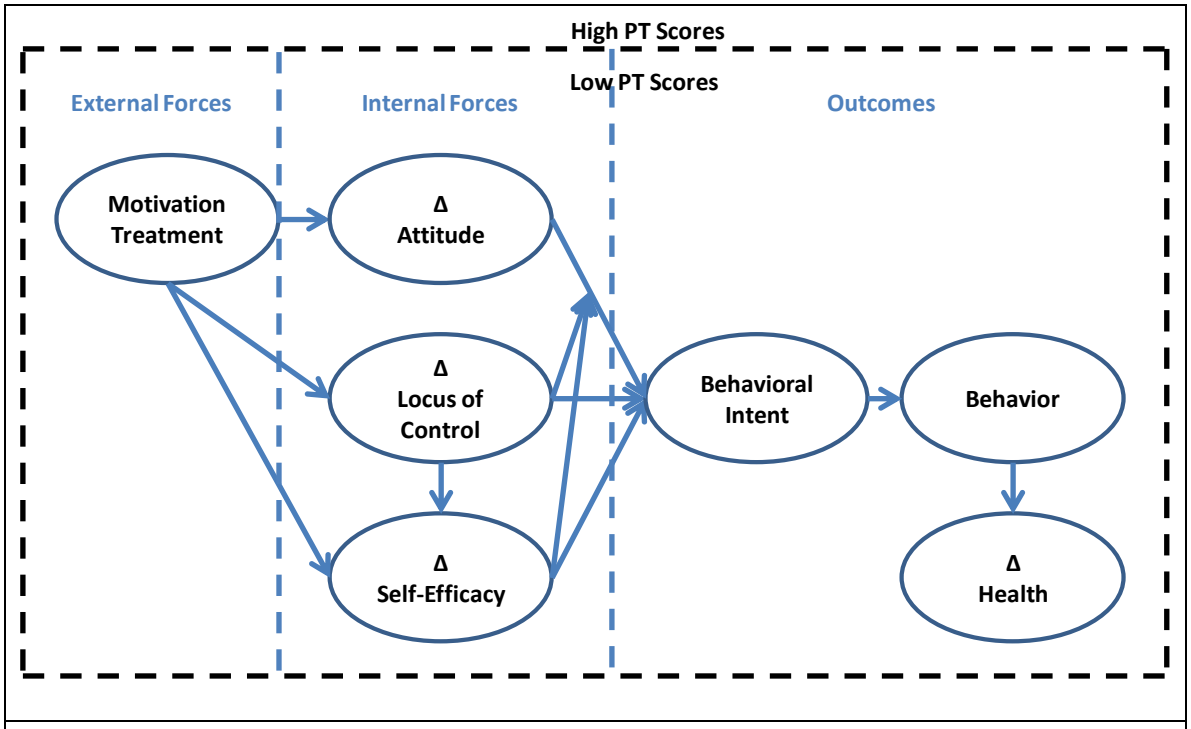

Figure 22 Future Research using Air Force PT Test Scores as the Health Measure

Conclusion

This thesis' two key findings were: first a cognitive-behavioral motivation treatment can positively affect cognitive changes that improve behavior and health, and second, a causal or mediation relationship appears to exist among the cognitive variables instead of a parallel relationship. The first finding could possibly change the way civilian institutions and the United States military decrease health care costs and improve both employee efficiency and mission capability. The second finding, if further researched, could change the predictive ability of the TPB from broad behaviors to specific behaviors. Ultimately this research proved successful and can contribute to the behavioral field in a practical and academic manner as well as potentially save the United States Air Force up to $40.03 million per year in civilian health care costs.

Appendix A

Motivation Survey (all pages)/Motivation Treatment (questions 1-36) Survey

Read each statement and using the scale below as a reference, circle the number rating from 1 “Strongly Disagree” to 7 “Strongly Agree” which indicates how you feel.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree

1.	Doing well in this program is important to me.	1	2	3	4	5	6	7
2.	I want to do well in this program.	1	2	3	4	5	6	7
3.	I will try my best in this program.	1	2	3	4	5	6	7
4.	I will try to do the very best I can while in this program.	1	2	3	4	5	6	7
5.	While participating in this program, I will work hard and try to do well.	1	2	3	4	5	6	7
6.	I want to be among the top performers in this program.	1	2	3	4	5	6	7
7.	I am extremely motivated to do well in this program.	1	2	3	4	5	6	7
8.	I just don’t care how I do in this program.	1	2	3	4	5	6	7
9.	I won’t put much effort into this program.	1	2	3	4	5	6	7
10.	I would like to do well in this program.	1	2	3	4	5	6	7
11.	It would be good to succeed while in this program.	1	2	3	4	5	6	7
12.	I want to succeed while in this program.	1	2	3	4	5	6	7
13.	If you do well in this program, you have a good chance of increasing your health.	1	2	3	4	5	6	7
14.	I think you will improve your health if you succeed in this program.	1	2	3	4	5	6	7

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree

15. How well you do in this program will affect your overall health.	1	2	3	4	5	6	7
16. The better you do in this program, the better your chance of increasing your health.	1	2	3	4	5	6	7
17. If you try to do your best in this program, you can get a significant result.	1	2	3	4	5	6	7
18. If you try hard you can make significant results in increasing your health.	1	2	3	4	5	6	7
19. You can improve your health in this program if you put some effort into it.	1	2	3	4	5	6	7
20. I will be able to achieve most of the goals that I have set for myself.	1	2	3	4	5	6	7
21. When facing difficult tasks, I am certain that I will accomplish them.	1	2	3	4	5	6	7
22. In general, I think that I can obtain outcomes that are important to me.	1	2	3	4	5	6	7
23. I believe I can succeed at most any endeavor to which I set my mind.	1	2	3	4	5	6	7
24. I will be able to successfully overcome many challenges.	1	2	3	4	5	6	7
25. I am confident that I can perform effectively on many different tasks.	1	2	3	4	5	6	7
26. Compared to other people, I can do most tasks very well.	1	2	3	4	5	6	7
27. Even when things are tough, I can perform quite well.	1	2	3	4	5	6	7
28. Performing well in this program is very important to me	1	2	3	4	5	6	7
29. Performing well in this program is personally meaningful to me.	1	2	3	4	5	6	7
30. Success in this program is meaningful to me.	1	2	3	4	5	6	7
31. I am confident about my ability to perform well in this program.	1	2	3	4	5	6	7
32. I am self-assured about my capabilities to perform well in this program.	1	2	3	4	5	6	7
33. I have mastered the skills necessary to perform well in this program.	1	2	3	4	5	6	7

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree

34.	I have significant autonomy in determining how I perform in this program.	1	2	3	4	5	6	7
35.	I can decide on my own how to go about obtaining results in this program.	1	2	3	4	5	6	7
36.	I have considerable opportunity for independence and freedom in how I perform in this program.	1	2	3	4	5	6	7
37.	My impact on what happens in my life is large.	1	2	3	4	5	6	7
38.	I have a great deal of control over what happens in my life.	1	2	3	4	5	6	7
39.	I have significant influence over what happens in my life.	1	2	3	4	5	6	7
40.	My opinion of myself goes up when I perform well in this program.	1	2	3	4	5	6	7
41.	I feel a great sense of personal satisfaction when I perform well in this program.	1	2	3	4	5	6	7
42.	I feel bad and unhappy when I discover that I have performed poorly in this program.	1	2	3	4	5	6	7
43.	My own feelings generally are not affected much one way or the other by how well I do in this program.	1	2	3	4	5	6	7
44.	Most people in this program feel a great sense of personal satisfaction when they do well.	1	2	3	4	5	6	7
45.	Most people in this program feel bad or unhappy when they find that they have performed poorly.	1	2	3	4	5	6	7
46.	Working with people all day is a strain for me.	1	2	3	4	5	6	7
47.	I feel burned-out from my work.	1	2	3	4	5	6	7
48.	I feel frustrated by my job.	1	2	3	4	5	6	7
49.	I feel I'm working too hard on my job.	1	2	3	4	5	6	7
50.	Working with people directly puts too much stress on me.	1	2	3	4	5	6	7
51.	I feel like I'm at the end of my rope.	1	2	3	4	5	6	7
52.	I feel emotionally drained from my work.	1	2	3	4	5	6	7
53.	I feel used up at the end of the day.	1	2	3	4	5	6	7
54.	I feel fatigued when I get up in the morning and have to face another day on the job.	1	2	3	4	5	6	7

55. I feel that I am a person of worth, at least on an equal basis with others.	1	2	3	4	5	6	7
56. I feel that I have a number of good qualities.	1	2	3	4	5	6	7
57. All in all, I am inclined to feel that I am a failure.	1	2	3	4	5	6	7
58. I am able to do things as well as most other people.	1	2	3	4	5	6	7
59. I feel that I do not have much to be proud of.	1	2	3	4	5	6	7
60. I take a positive attitude toward myself.	1	2	3	4	5	6	7
61. On the whole, I am satisfied with myself.	1	2	3	4	5	6	7
62. I wish I could have more respect for myself.	1	2	3	4	5	6	7
63. I certainly feel useless at times.	1	2	3	4	5	6	7
64. At times I think I am no good at all.	1	2	3	4	5	6	7
65. Whether or not I get to be a leader depends mostly on my ability.	1	2	3	4	5	6	7
66. When I make plans, I am almost certain to make them work.	1	2	3	4	5	6	7
67. When I get what I want, it's usually because I'm lucky.	1	2	3	4	5	6	7
68. I have often found that what is going to happen will happen.	1	2	3	4	5	6	7
69. I can pretty much determine what will happen in my life.	1	2	3	4	5	6	7
70. I am usually able to protect my personal interests.	1	2	3	4	5	6	7
71. When I get what I want, it's usually because I worked hard for it.	1	2	3	4	5	6	7
72. My life is determined by my own actions.	1	2	3	4	5	6	7
73. Whether or not I get to be a leader depends mostly on my ability.	1	2	3	4	5	6	7

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree

74. My feelings are easily hurt.	1	2	3	4	5	6	7
75. I'm a nervous person.	1	2	3	4	5	6	7
76. I'm a worrier.	1	2	3	4	5	6	7
77. I am often tense or "high strung."	1	2	3	4	5	6	7
78. I often suffer from "nerves."	1	2	3	4	5	6	7
79. I am often troubled by feelings of guilt.	1	2	3	4	5	6	7
80. My mood often goes up and down.	1	2	3	4	5	6	7
81. Sometimes I feel miserable for no reason.	1	2	3	4	5	6	7
82. I am an irritable person.	1	2	3	4	5	6	7
83. I often feel fed up.	1	2	3	4	5	6	7
84. I often worry too long after an embarrassing experience.	1	2	3	4	5	6	7
85. I often feel lonely.	1	2	3	4	5	6	7

1	2	3	4	5
Very slightly or not at all	A Little	Moderately	Quite a Bit	Extremely

Rate the following items as to what extent you generally feel this way, that is, how you feel on average

86. Interested	1	2	3	4	5
87. Distressed	1	2	3	4	5
88. Excited	1	2	3	4	5
89. Upset	1	2	3	4	5
90. Strong	1	2	3	4	5
91. Guilty	1	2	3	4	5
92. Hostile	1	2	3	4	5
93. Enthusiastic	1	2	3	4	5
94. Proud	1	2	3	4	5
95. Irritable	1	2	3	4	5
96. Alert	1	2	3	4	5
97. Ashamed	1	2	3	4	5
98. Inspired	1	2	3	4	5
100. Nervous	1	2	3	4	5
101. Determined	1	2	3	4	5
102. Attentive	1	2	3	4	5
103. Jittery	1	2	3	4	5
104. Active	1	2	3	4	5
105. Afraid	1	2	3	4	5

Demographics Survey

Please provide the following demographic information.

1. Gender:_____
2. Job type (e.g. Program Management, Contracting, Finance, Cost, Logistics, etc.):__

   _____
3. Years of work experience:_____
4. Highest level of education:_____
5. Organizational level of current position (e.g. HQ Staff, Functional Staff, Wing, Group, Squadron, Program level):_____
6. Organization:_____
7. Do you use tobacco products? _____ If yes, how often?_____
8. How often do you consume alcohol?_____
9. How far do you need to travel to get to the gym where you typically work out?_____

Appendix B

CFA for Survey Validation

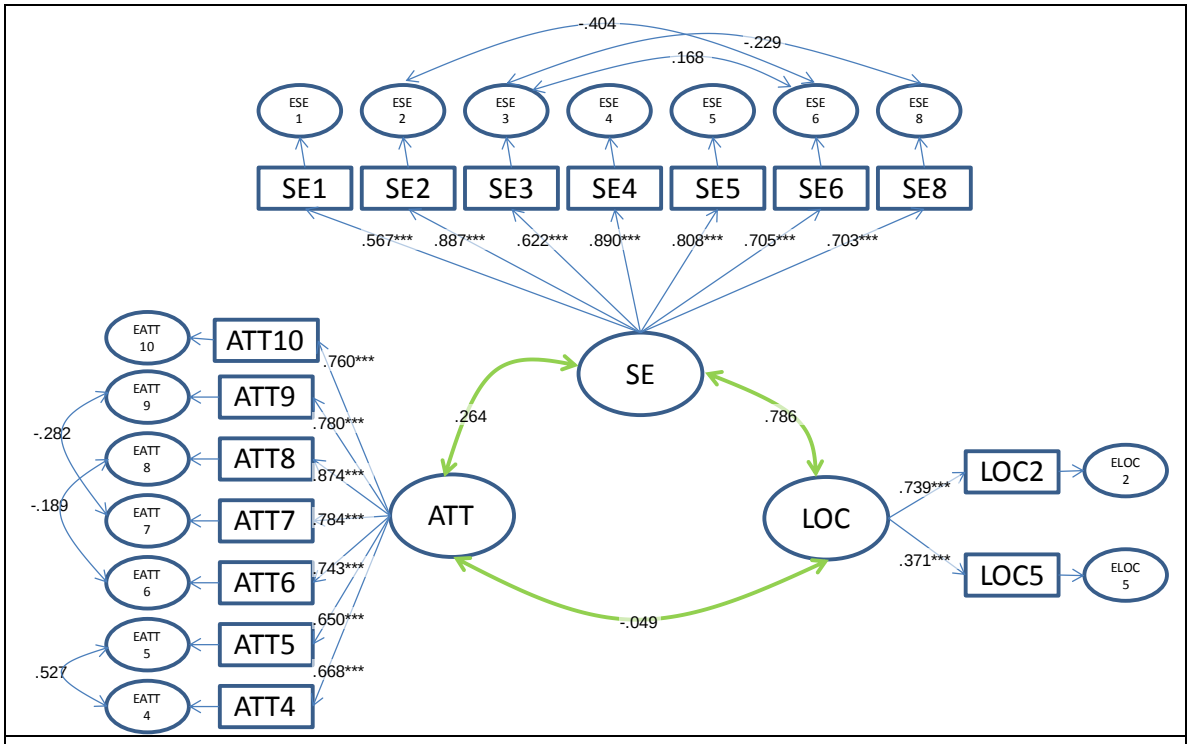

Figure 23 CFA for Survey Validation

Notes: standardized regression weights shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

Table 5 Sample Correlation Matrix

	SE1	SE2	SE3	SE4	SE5	SE6	SE8	LOC2	LOC5	ATT4	ATT5	ATT6	ATT7	ATT8	ATT9	ATT10	Treatment	Behavior	Health
SE1	1	.480	0.313	0.503	0.524	0.459	0.374	0.277	0.140	0.063	0.004	0.186	0.110	0.263	-0.046	0.064	0.297	-0.393	0.223
SE2	0.48	1	0.572	0.805	0.687	0.497	0.583	0.586	0.315	0.088	0.050	0.253	0.246	0.222	0.012	0.189	0.269	-0.309	0.118
SE3	0.313	0.572	1	0.512	0.538	0.524	0.309	0.442	0.288	-0.101	0.051	0.097	0.224	0.02	-0.074	0.025	0.043	-0.426	-0.020
SE4	0.503	0.805	0.512	1	0.723	0.596	0.377	0.516	0.178	0.145	0.014	0.207	0.228	0.179	-0.003	0.173	0.218	-0.437	0.154
SE5	0.524	0.687	0.538	0.723	1	0.631	0.576	0.385	0.300	0.113	0.117	0.262	0.206	0.132	-0.026	0.113	0.214	-0.425	0.291
SE6	0.459	0.497	0.524	0.596	0.631	1	0.514	0.385	0.119	-0.049	-0.037	0.215	0.156	0.147	-0.094	0.070	0.140	-0.458	-0.028
SE8	0.374	0.583	0.309	0.677	0.576	0.514	1	0.370	0.098	0.200	0.071	0.239	0.309	0.370	0.131	0.108	0.285	-0.295	0.192
LOC2	0.277	0.586	0.442	0.516	0.385	0.385	0.370	1	0.274	-0.112	-0.073	0.102	0.058	-0.026	-0.075	-0.111	0.291	-0.246	-0.082
LOC5	0.14	0.315	0.288	0.178	0.300	0.119	0.098	0.274	1	-0.045	-0.057	0.045	0.052	-0.123	-0.080	0.066	0.282	-0.014	-0.306
ATT4	0.063	0.088	-0.101	0.145	0.113	-0.049	0.200	-0.112	-0.045	1	0.73	0.522	0.509	0.553	0.529	0.523	0.199	-0.061	0.347
ATT5	0.004	0.05	0.051	0.014	0.117	-0.037	0.071	-0.073	-0.057	0.730	1	0.501	0.550	0.520	0.542	0.450	0.17	-0.031	-0.006
ATT6	0.186	0.253	0.097	0.207	0.262	0.215	0.239	0.102	0.045	0.522	0.501	1	0.572	0.583	0.543	0.593	0.233	-0.067	0.113
ATT7	0.110	0.246	0.224	0.228	0.206	0.156	0.309	0.058	0.052	0.509	0.550	0.572	1	0.682	0.496	0.576	0.135	-0.194	0.056
ATT8	0.263	0.222	0.020	0.179	0.132	0.147	0.370	-0.026	-0.123	0.553	0.520	0.583	0.682	1	0.696	0.645	0.141	-0.089	0.198
ATT9	-0.046	0.012	-0.074	-0.003	-0.026	-0.094	0.131	-0.075	-0.080	0.529	0.542	0.543	0.496	0.696	1	0.599	0.011	0.084	0.043
ATT10	0.064	0.17	0.025	0.173	0.113	0.070	0.108	-0.111	0.066	0.523	0450	0.593	0.576	0.645	0.599	1	0.128	-0.102	0.201
Treatment	0.297	0.269	0.043	0.218	0.214	0.140	0.285	0.291	0.282	0.199	0.170	0.233	0.135	0.141	0.011	0.128	1	-0.204	-0.247
Behavior	-0.393	-0.309	-0.426	-0.437	-0.425	-0.458	-0.295	-0.246	-0.014	-0.061	-0.031	-0.067	-0.194	-0.089	0.084	-0.102	-0.204	1	-0.296
Health	0.223	0.118	-0.020	0.154	0.291	-0.028	0.192	-0.082	-0.306	0.347	-0.006	0.113	0.056	0.198	0.043	0.201	-0.247	-0.296	1

Research SEM Model without Attitude

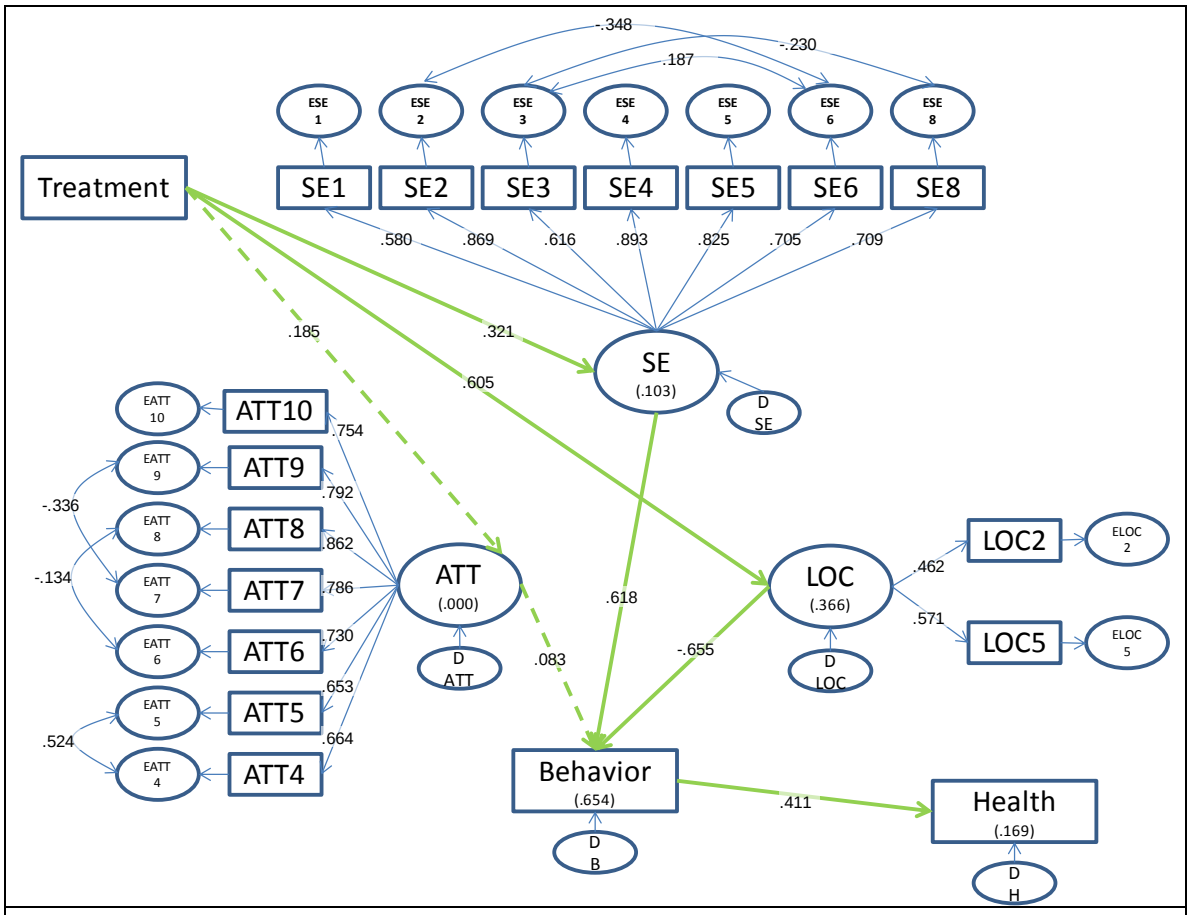

Figure 24 Research SEM Model without Attitude

Notes: standardized regression weights shown

Solid arrows signify significant paths; dashed arrows signify non-significant paths

Research SEM Model with Self-Efficacy Moderator

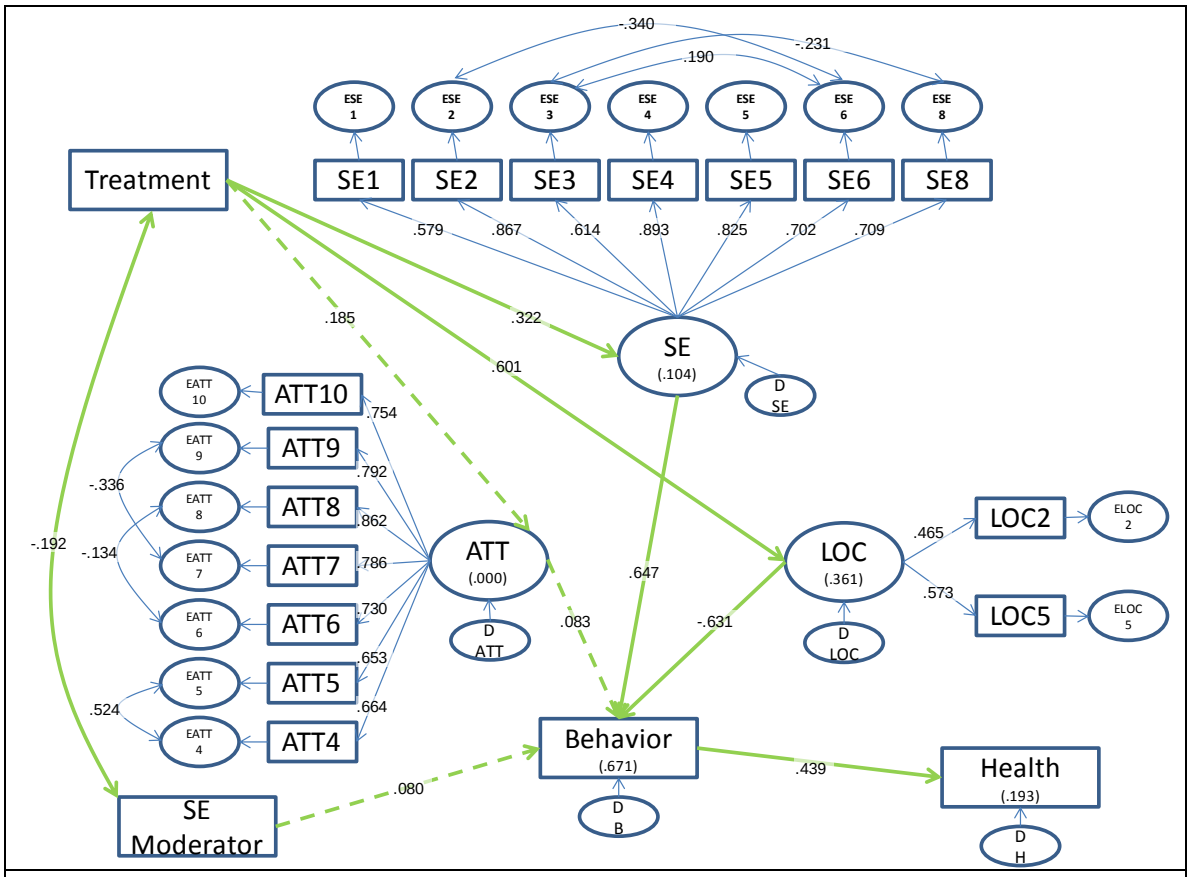

Figure 25 Final SEM Model with Self-Efficacy Moderator

Notes: standardized regression weights shown

Solid arrows signify significant paths; dashed arrows signify non-significant paths

Research SEM Model with Moderators

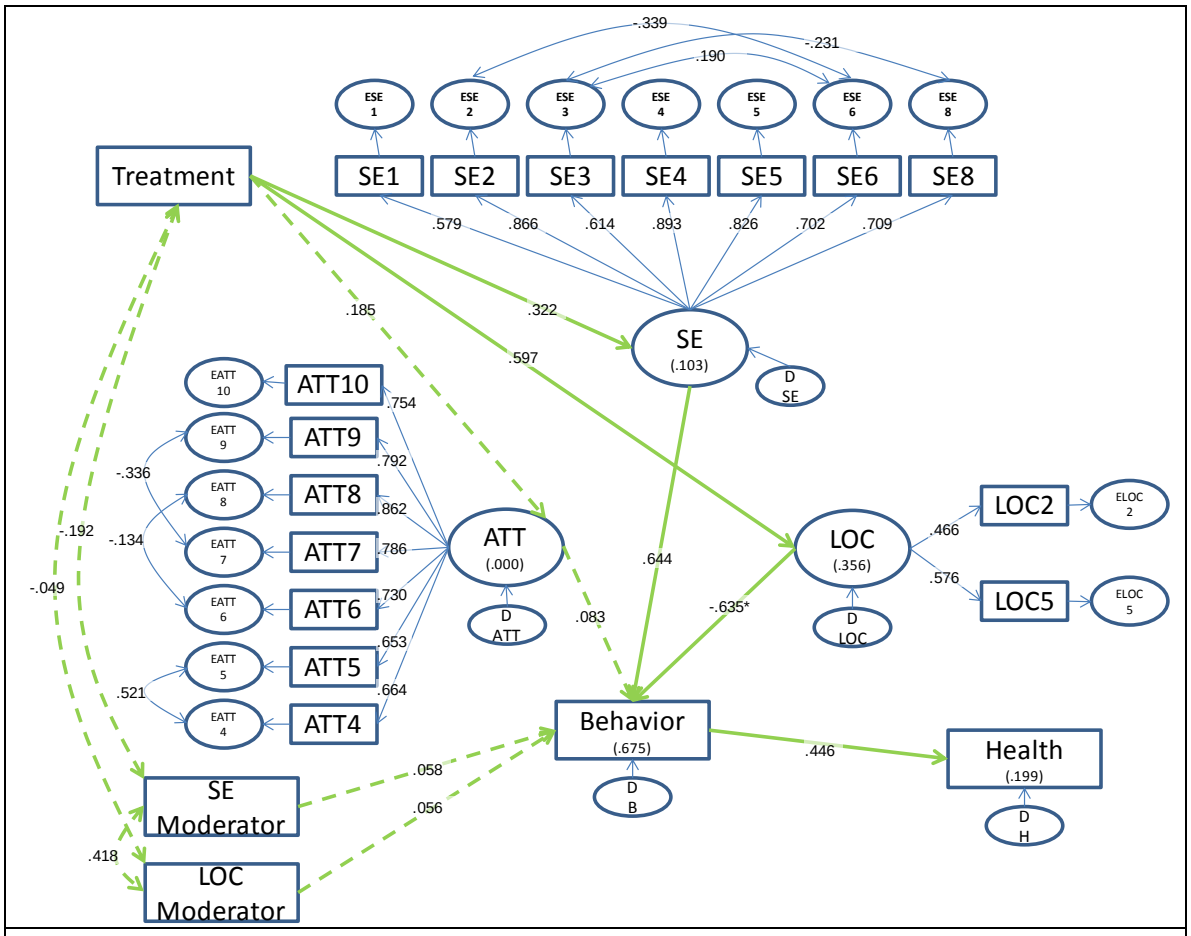

Figure 26 Final SEM Model with Moderators

Notes: standardized regression weights shown

Solid arrows signify significant paths; dashed arrows signify non-significant paths

Research SEM Model with Locus of Control Moderator

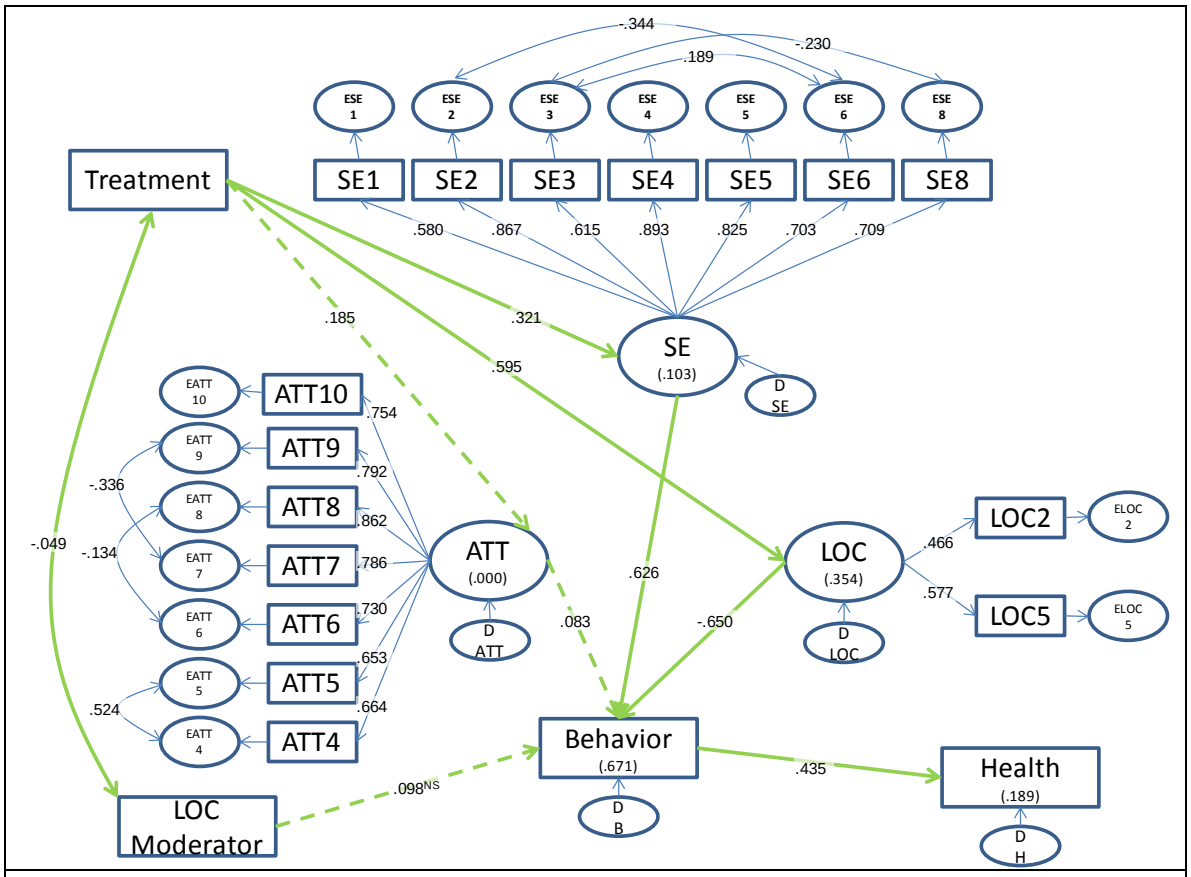

Figure 27 Final SEM Model with Locus of Control Moderator

Notes: standardized regression weights shown

Solid arrows signify significant paths; dashed arrows signify non-significant paths

First Alternate Model

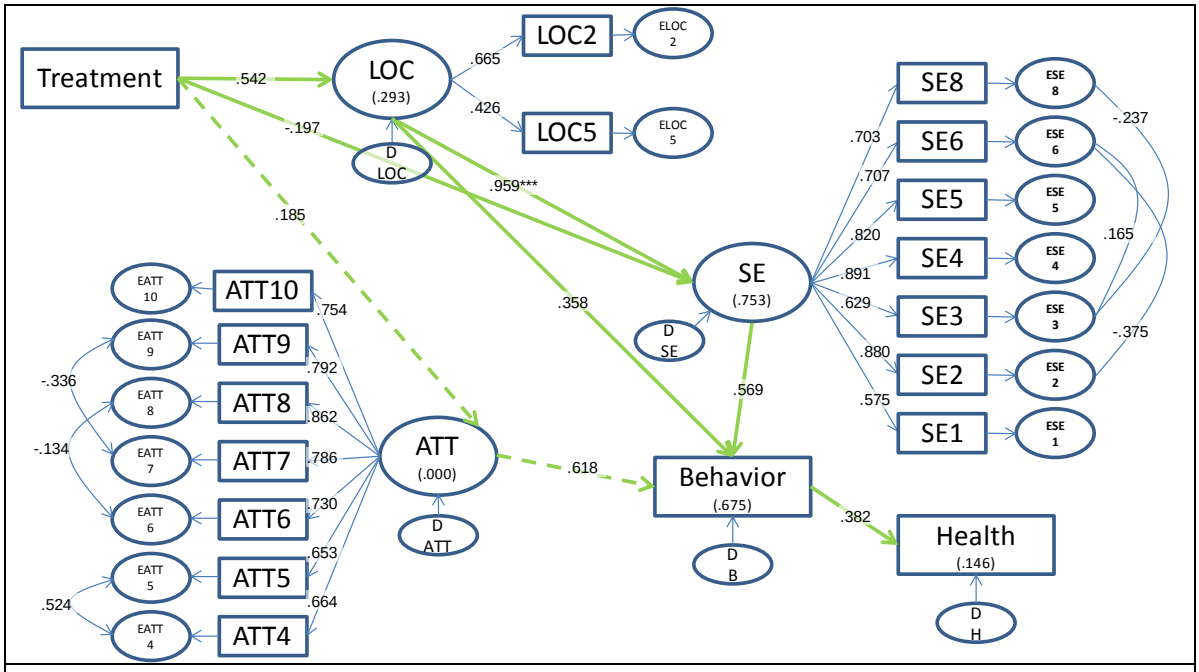

Figure 28 First Alternate Model

Notes: standardized regression weights shown

Solid arrows signify significant paths; dashed arrows signify non-significant paths

Second Alternate Model

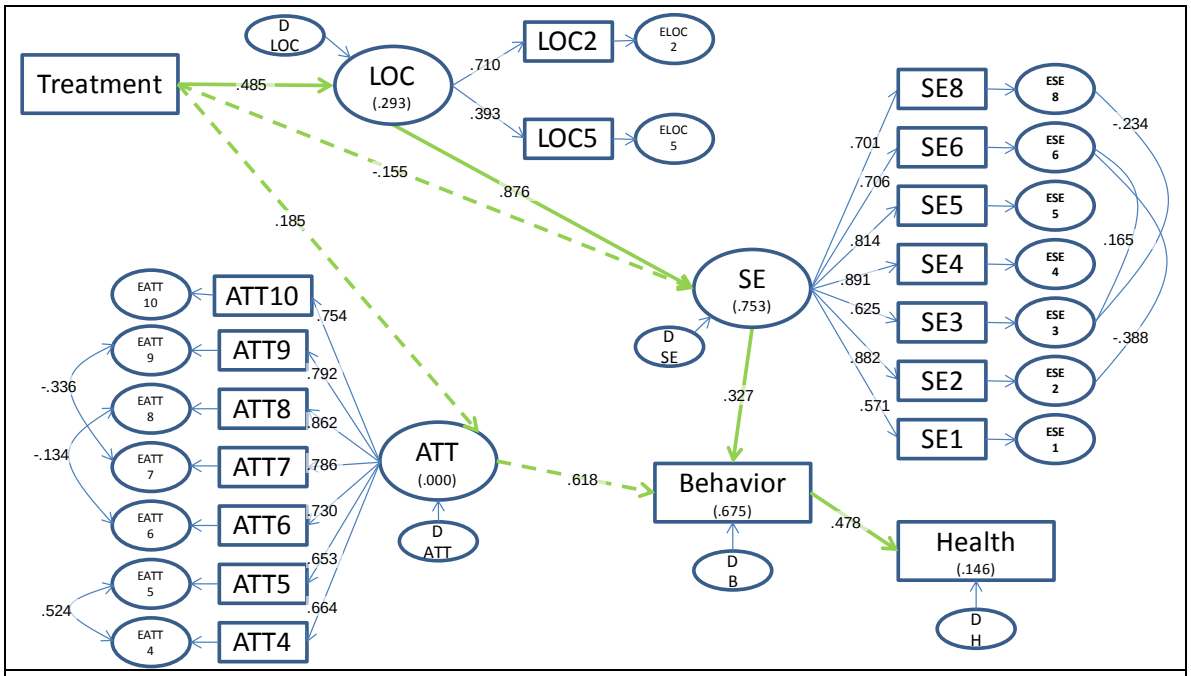

Figure 29 Second Alternate Model

Notes: standardized regression weights shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

Third Alternate Model

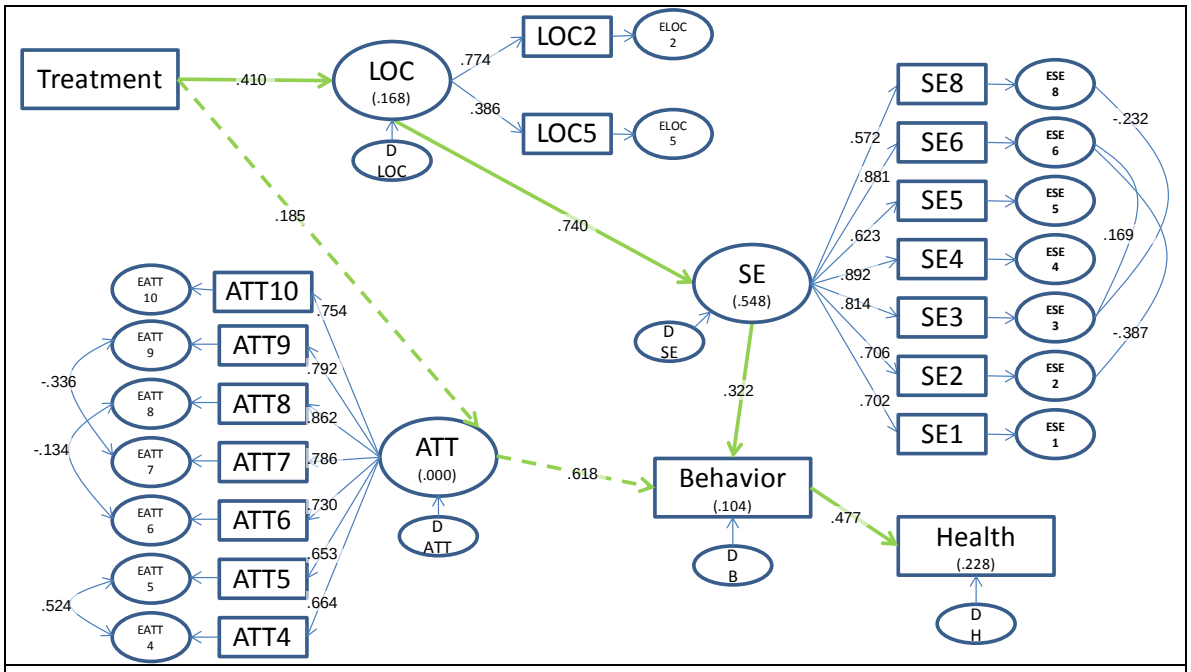

Figure 30 Third Alternate Model

Notes: standardized regression weights shown
Solid arrows signify significant paths; dashed arrows signify non-significant paths

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Vita

Captain Aimee Tjelmeland Kirchner graduated from Colorado State University with a Bachelor of Science degree in Business Administration. She was commissioned through Air Force Reserve Officers' Training Corps Detachment 090 at Colorado State University. Her first assignment was at the United States Air Force Academy, Colorado, where she held the positions of Deputy Chief Financial Services for Headquarters United States Air Force Academy, Deputy Chief Financial Analysis for Headquarters United States Air Force Academy, and Member Commander's Action Group for the Superintendent of the United States Air Force Academy. In August 2010, she entered the Graduate School of Engineering and Management, Air Force Institute of Technology, where she earned a Master of Science degree in Cost Analysis. Upon graduation, she will be assigned to the Special Operations and Personnel Recovery Branch of the Aeronautical Systems Center, Wright Patterson Air Force Base, Ohio.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From – To)*
22-03-2012	Master's Thesis	16-08-2012 – 22-03-2012

4. TITLE AND SUBTITLE
The Effects of Cognitive-Behavioral Motivation for Health Improvement on Anthropometric Measurements in High Risk Individuals

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Kirchner, Aimee T., Captain, USAF

5d. PROJECT NUMBER
N/A

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)
Air Force Institute of Technology
Graduate School of Engineering and Management (AFIT/EN)
2950 Hobson Way, Building 640
WPAFB OH 45433-7765

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GCA/ENV/12-M02

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
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10. SPONSOR/MONITOR'S ACRONYM(S)
HAWC

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE DISTRIBUTION IS UNLIMITED

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Unhealthy lifestyles cost businesses, governmental organizations, and the United States military billions of dollars every year. To fight this rising cost as well as potentially save lives this study sought to understand if a cognitive-behavioral motivation treatment could positively affect the cognitive variables (attitude, self-efficacy, and locus of control) that induce long term behavior change. Anthropometric measurements, specifically body mass index, abdominal circumference, and abdominal height, were used to determine if long term behavior change resulted from the treatment. The Theory of Planned Behavior was the basis of this thesis' model, while the Valence, Instrumentality, and Expectancy (VIE) theory was the foundation for the cognitive-behavioral motivation treatment. Structural Equation Modeling (SEM) tested the theory based model and found two results: a cognitive-behavioral motivation treatment can positively affect cognitive changes that improve behavior and health and, a causal or mediation relationship among the cognitive variables of locus of control and self-efficacy was found instead of the predicted parallel relationship. Effective implementation of an intervention like the one used in this study could lower the United States Air Force's health care bill by as much as $40 million, improve employee efficiency and mission capability, enable longer healthier lives, and prevent premature death.

15. SUBJECT TERMS
Cognitive, Behavior, Motivation, The Theory of Planned Behavior, VIE theory, Anthropometric Measurements, and Health

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Ladd, Darin A., Lt Col, Ph.D, USAF
U	U	U	UU	130	19b. TELEPHONE NUMBER *(Include area code)* (937) 255-6565, x 3323 (Darin.Ladd@afit.edu)